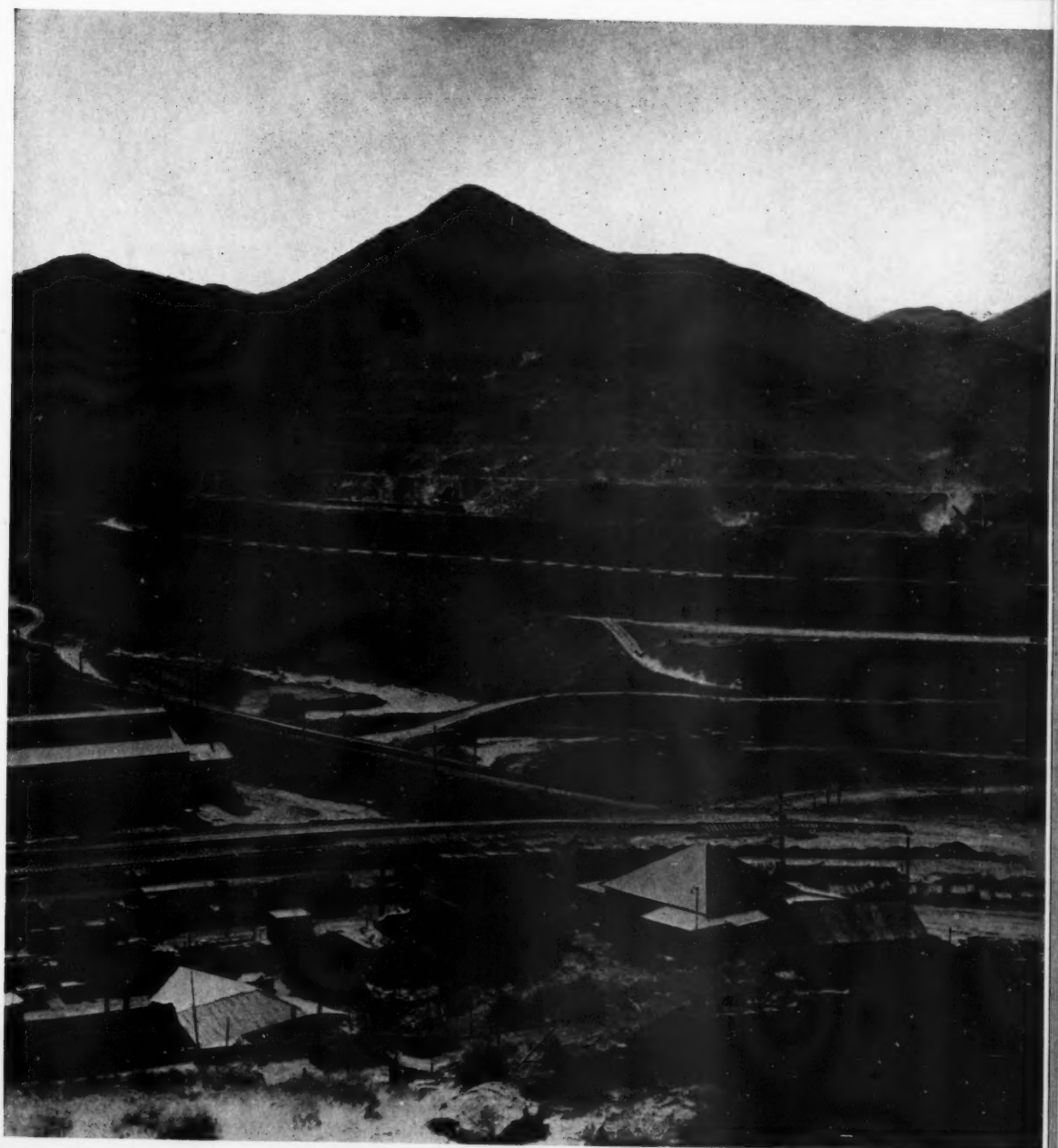
MINING CONGRESS JOURNAL

NOVEMBER
1941



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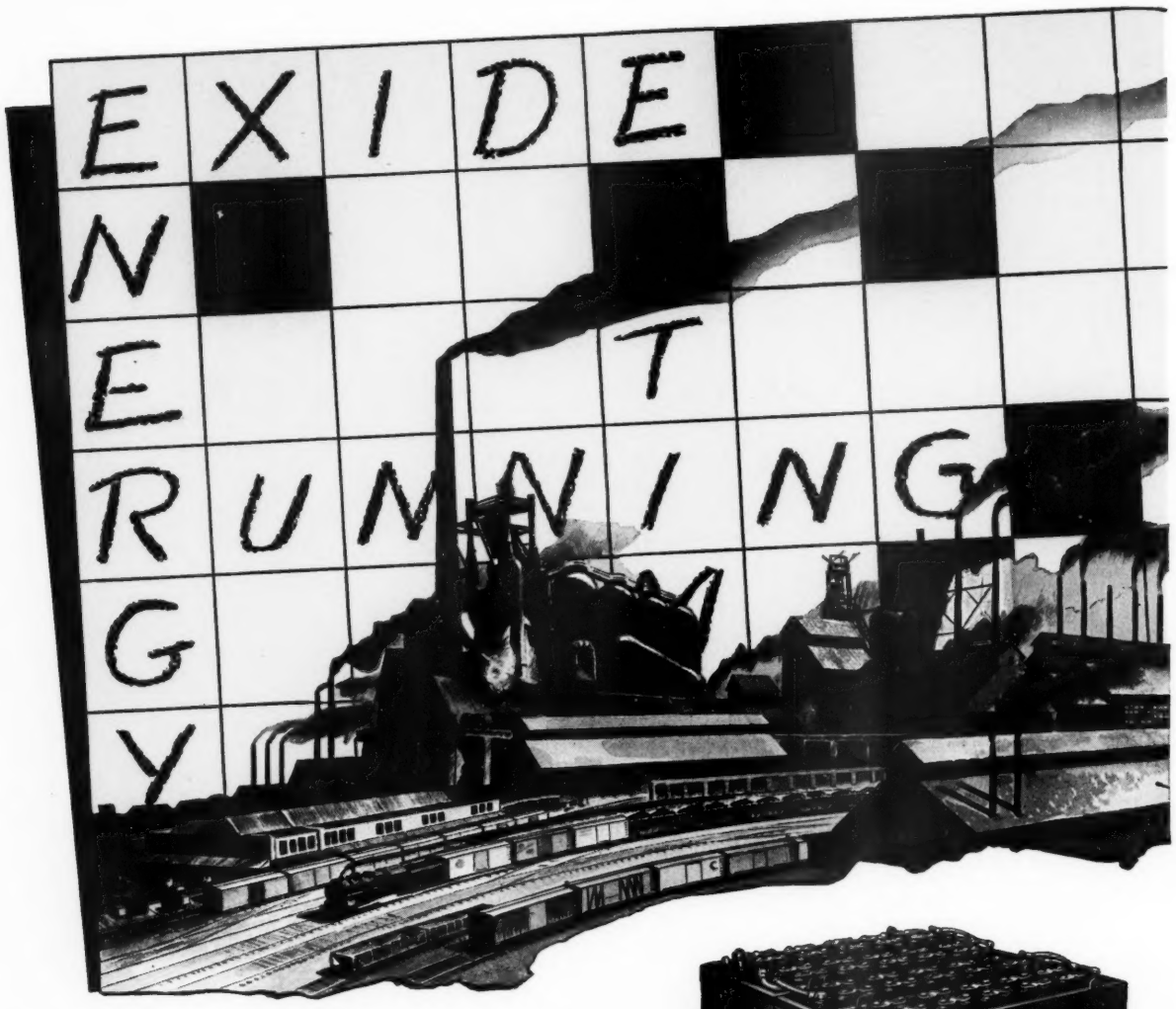

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MINING CONGRESS JOURNAL

Vol. 27 — NOVEMBER, 1941 — No. 11

The courage and foresight of the Phelps-Dodge Corporation in starting, during the depression years, development of the tremendous Clay orebody at Morenci, Ariz., to produce an estimated 75,000 tons of copper per year, and and costing in excess of $34,000,000, is beginning to bear fruit at a most opportune time as the company completes preparations for quantity production from the pit.

Even before the program is completed negotiations have led to the announcement that the RFC will finance additional expansion, to start immediately, to increase the mine and plant capacity by 80 percent. A production of 130,000 tons of copper per year is contemplated.

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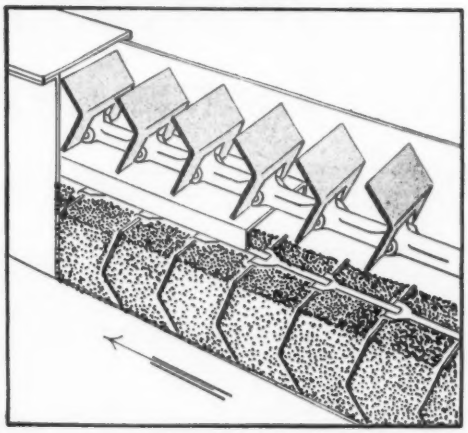

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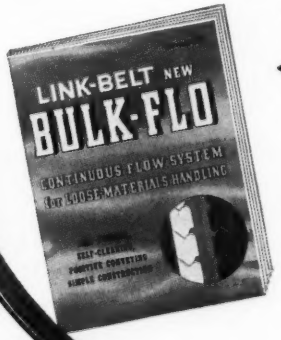

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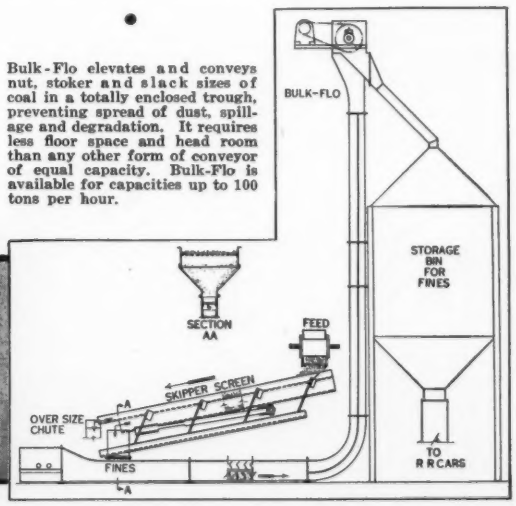

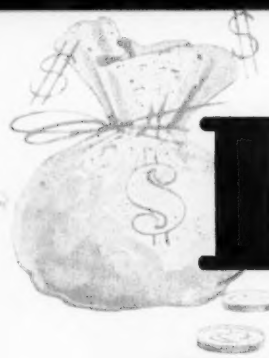

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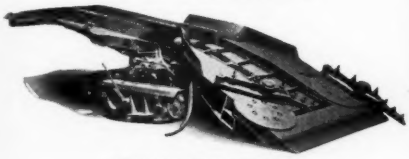

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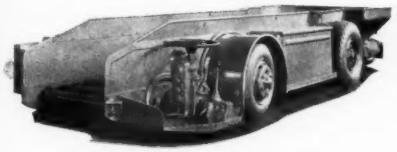

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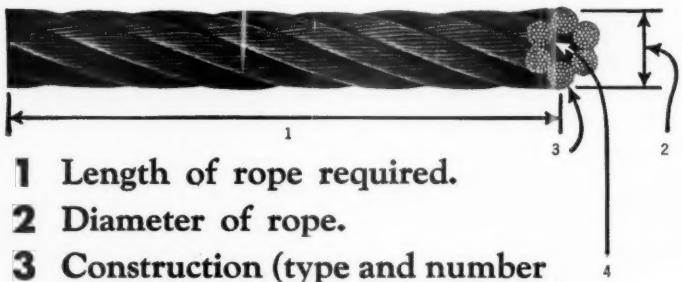
Therefore, to get the proper rope, give the manufacturer *all* the available information, which should include the following:



1. Length of rope required.
2. Diameter of rope.
3. Construction (type and number of strands and of wires per strand).
4. Type of core (whether hemp or wire center).
5. Grade of steel.
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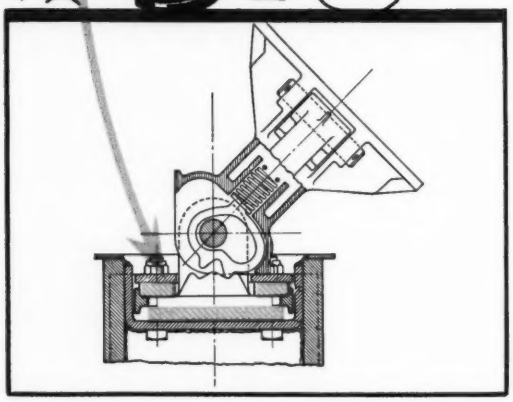

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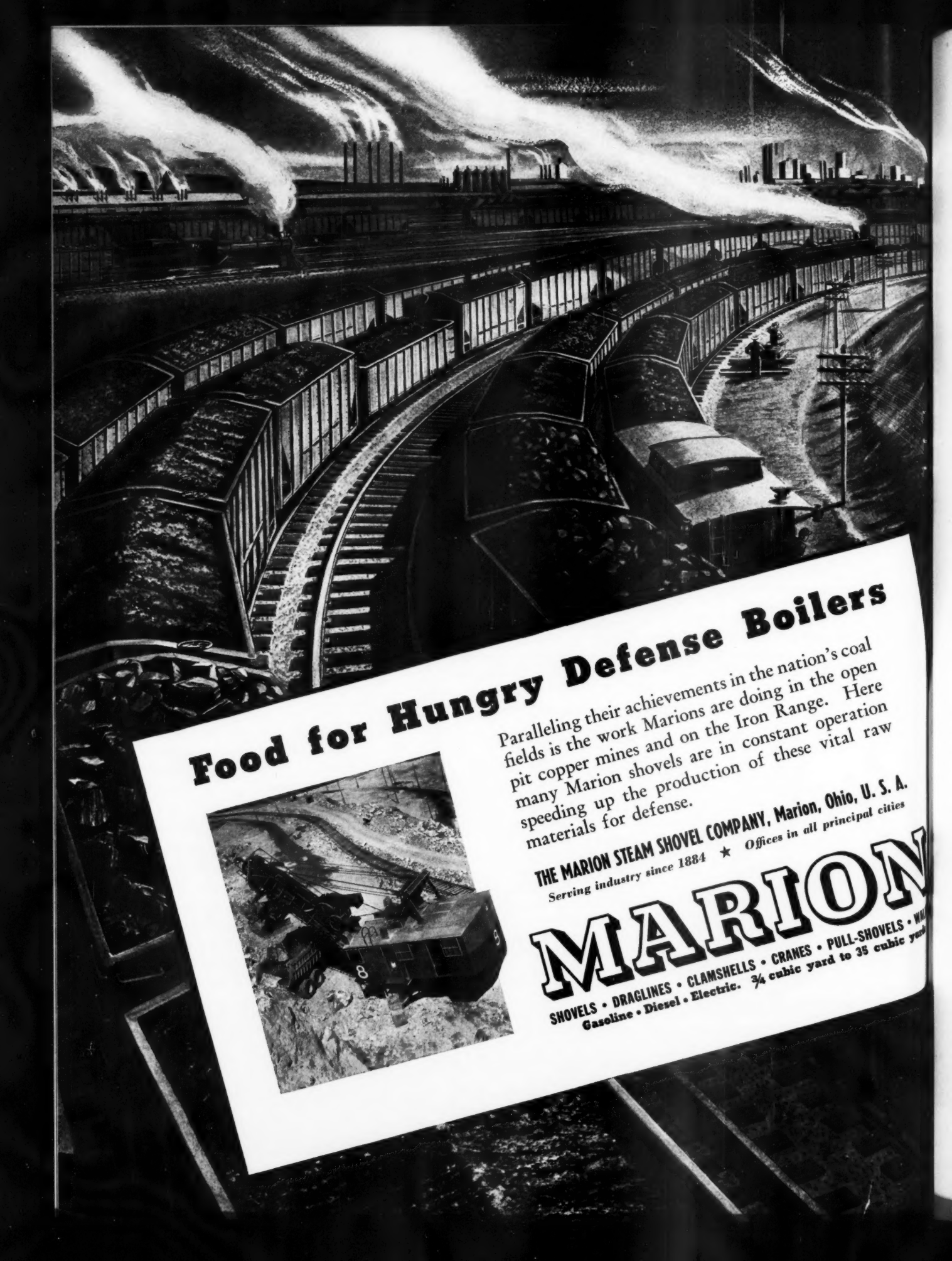

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A JOURNAL FOR THE ENTIRE MINING INDUSTRY—PUBLISHED BY THE AMERICAN MINING CONGRESS

MINING CONGRESS JOURNAL

RUSSELL C. FLEMING
Editor

Vol. 27 NOVEMBER, 1941 No. 11

OUR WAY OF LIFE

THE democratic way of life is based on government to produce the greatest good for the greatest number; it is to preserve that way of life that we are now, following the torpedoing of the destroyers *Kearny* and *Reuben James*, in actuality engaged in a shooting war.

But the preservation of our democratic institutions, as well as other democratic institutions over the world, calls for the submergence of private interest for the public good. If our defense effort can not be organized effectively because of the interposition of minor groups more interested in self-gain than in the public welfare, then we are destined to go the way of France. And lip service is not enough; protestations of patriotism will not be effective against panzer divisions and submarines.

Then how about these strikes in defense industries? Acknowledging that some strikes are like boils, the outward manifestation of an inward infection, it does not follow that these defense strikes are justified now or ever. Is a man justified in laying down the tools with which he is assembling bombers, in order to settle a jurisdictional dispute between union leaderships? Is a coal miner justified in striking over the sole issue of the closed shop in captive mines, when his quitting means an almost immediate stoppage in steel production—the very vitals of defense? For that matter, is an anthracite miner justified in striking because he feels that union dues and assessments are too high? If the answer is left to the average working man himself the answer would almost certainly be "no." The Administration attitude, the National Labor Mediation Board, and the Wage-Hour Division, Department of Labor, have been lenient and liberal to labor; and, in the opinion of many, almost to the point of complete capitulation to the self-interests of union leadership. It is unpatriotic and grossly unfair to take further advantage of this liberal policy through work stoppages caused primarily by a desire to "get plenty while the getting is good"!

That is not the way wars are won. Before the world sees peace again, and after, every man, woman and child in the country must sacrifice a great deal to achieve a victory enabling us to preserve our personal rights—including even the rights of union members to strike. If the interests of self prevail now over community interests, we stand in extreme danger of losing all personal rights, just as the worker in Germany has already lost all of what we consider as "inalienable" rights. A temporary and voluntary submergence of self-interest is a small price to pay for the permanent endurance of our established democratic ways.

The lessons of history are even now being written in large letters, and we need to heed them. The disunity of France, an inability of opposed groups to compromise for the common good, and internal dissension led to her downfall. On the other hand, Germany has imposed an iron discipline from the top that prevents all individuality in action and, no doubt partly as a result, has so far had astounding military success.

Either extreme would be calamitous to us, but we have yet to prove that through personal and voluntary moderation and self-sacrifice and courage we can build a solidarity capable of overcoming an ideology such as Germany's. The defense strikes are symptoms that we are not heeding the lesson of France.

THE PHILOSOPHER'S STONE

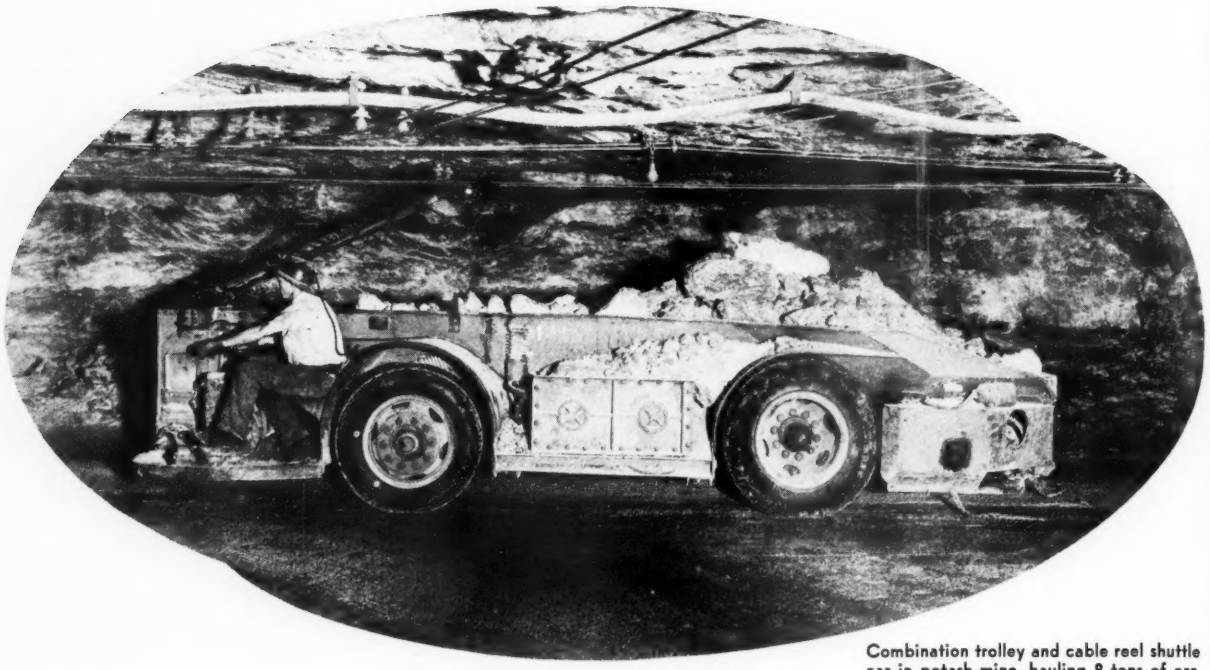
BELIEFS and avowals that there are vast quantities of gold or other metals in the beds of the dry lakes of the West persistently come to light. The claims usually made are that the gold or platinum or mercury is in a "colloidal" form or has a peculiar atomic structure which renders it incapable of detection by ordinary methods of analysis such as the fire assay; and that, further, the metal can only be recovered by a "special" and secret process discovered by the claimant.

These claims continue to arise frequently even though they are, as frequently, exploded by careful and competent scientific investigation. To be charitable, perhaps these people are self-deluded and the victims of wishful thinking; but it is to be strongly suspected that most of them are perpetrating or have had perpetrated upon them a deliberate hoax, which sometimes succeeds. So it becomes necessary for competent authority to investigate these promotions as they arise.

The Nevada State Bureau of Mines and the Mackay School of Mines have just published Bulletin No. 35, by Jay Carpenter, Director, on "An Investigation as to the Presence of Commercial Quantities of Mercury and Gold in the Dry Lakes of Nevada." It is a sober scientific report and valued as such, but it has its lighter and more entertaining side in quoting statements made by "inventors," "discoverers" and "mining engineers" regarding the mineral wealth of some of the dry lake beds of that state.

There is sometimes a similarity between these claims and those of the ancient alchemists, who believed that all substances were composed of one primitive matter, and that differences which could be imposed on that *prima materia* resulted in different materials. The prima materia was early identified with mercury, which it was believed could be given certain mystical properties, and then treated with the "philosopher's stone" to obtain silver or gold.

Modern science is making successful attempts to transmute matter by changing atomic structure, but experiments have not yet even remotely reached the stage where base metals can be transmuted into precious ones on a commercial scale, or precious metals obtained in commercial quantities from dry lake beds where usual and accepted methods of analysis show none or only infinitesmal quantities to exist.



Combination trolley and cable reel shuttle car in potash mine, hauling 8 tons of ore from working face to winze

SHUTTLE CAR HAULAGE FOR METAL MINES

By L. E. YOUNG
Consulting Engineer
Pittsburgh, Pa.

Wide and increasing acceptance of rubber-tired shuttle car haulage in coal mines is demonstrating forcefully that, under certain conditions, that type of equipment may also have considerable application at mines other than coal. Dr. Young covers this whole subject, pointing out where shuttle cars are now being used in metal and non-metallic mines, and outlines the factors to be considered in their application.

THE extensive and successful use of rubber-tired trucks in open-pit metal and coal mining, with the elimination of miles of track, raised many questions in the minds of operators of competitive underground mines. For the bituminous coal operator the challenge of the "stripper" was so serious that revolutionary methods of loading and hauling coal underground became necessary. It is unnecessary to call the attention of the mining industry generally to the great strides that coal mining has made in underground mechanical loading, but very few metal-mine operators have had the opportunity to secure first-hand information on the comparatively recent introduction of several new methods of "trackless" mining in American underground coal mines.

When first used, the term "trackless" mining was applied to the transportation of coal from the workingplace by means of chain-and-flight, shaking, or belt conveyors, whether the material was loaded by hand or mechanically. The term may be applied as well when slushers or scrapers are used. More recently, however, the term has been used in coal mining to refer to any system of mining flat or moderately dipping beds where the material is shot down and then loaded into rubber-tired cars, and where track is eliminated entirely from the active productive workings of the mine.

In this paper the discussion will be limited to the use of rubber-tired cars in hauling from the working face, the loading-slide or ramp, or the chute to the point where the material is

transferred to mine cars, cans, or conveyors, or where it is dumped into pockets, bins, or winzes.

First Rubber-Tired Underground Haulage in 1936

While rubber-tired trucks have been run into drift limestone mines for some time, and occasionally have been used for short hauls in tunnel construction, the practical application of rubber-tired haulage in mines dates from 1936 when J. H. Fletcher developed a system of automotive haulage using a power unit and a trailer for gathering haulage. Mr. Fletcher's first installation was at the mine of the Blue Bird Coal Company in Illinois in coal 48 ins. to 54 ins. thick.

The tractor he used was propelled by electric storage batteries and (in the original installation) drew 3-ton drop-bottom trailer cars. These trailer cars were backed into the working place and loaded mechanically by a caterpillar-type of mobile loading machine. Two tractors served one loading machine and hauled the material 500 to 1,000 ft. to a dump hopper, located in the floor and from which the material was transferred to standard mine cars by conveyor. The 3-ton trailer car of this installation stands 31 ins. high when empty and 30 ins. when loaded. The outside width is 6 ft. 3 ins., and the length 10 ft. 6 ins.

Objectives in Shuttle Car System

The rubber-tired car principle was well received and other types and designs of cars have been installed in many coal mines with different height seams and working conditions. It may be noted that the shuttle-car development is largely a result of the effort to increase production by improving transportation between the mechanical loading device and the main-line haulage. In fact, the significance of this type of haulage is not appreciated by the metal miner until he realizes that bituminous coal mining has accepted the principle of the "continuous" mechanical loader in contrast with the intermittent type of loading device such as the shovel, the dipper, or the scraper. The "continuous" mechanical loader, whether mounted on a track or on caterpillars, will load out all the loose material rapidly—with the larger types of machines the rate of loading being as much as 8 to 10 tons per minute. Obviously, there is little reason for having such a high-capacity loading machine if the car or "can" being loaded is of small capacity and the "car change" is slow. The whole cycle must be timed to approximate the practical operating capacity of the loading machine. The logical development was to place the equipment on "cats" or rubber in order to eliminate the track and switches and reduce the number of car changes by increasing the size of the car.

Many of the older coal mines have long hauls and a substantial investment in tipples, shafts, etc., which were constructed for what is now considered to be a small mine car. Any increase in width, length, and overall height of mine car is generally impractical in old coal mines. If larger mine cars are to be used in connection with the loading operation, there must be a transfer of coal to the old-style car somewhere before the old narrow haulage roads are reached. With the rubber-tired shuttle cars, the elevator, loading-head, or transfer point is usually not over 500 to 1,000 ft. from the working faces.

L. E. Young

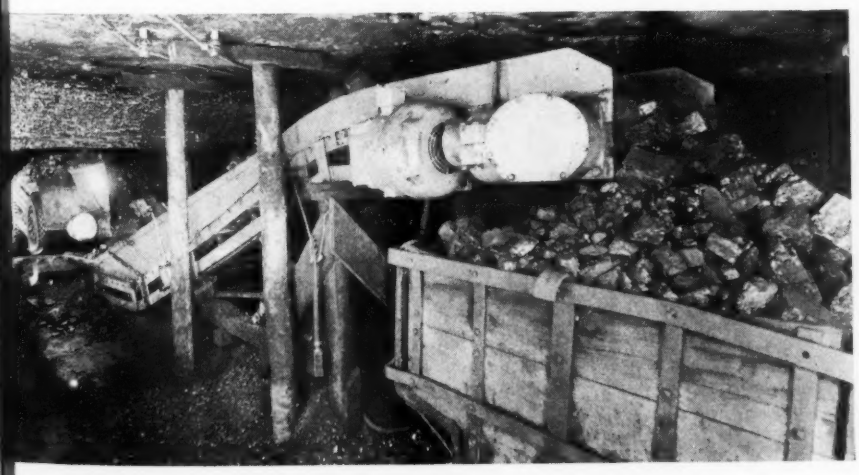
One of the early applications of rubber-tired shuttle cars was in a mine where it was first necessary to clean out old entries and rooms and then mine out a large area of pillar coal. The maneuverability and flexibility of the equipment under these difficult conditions resulted in substantial savings over the previous system of laying the track and switches which had always been required in the traditional "block" system of mining in the Appalachian coal fields.

It should be noted that one of the chief objectives in the elimination of track from the working rooms of coal mines is to avoid the conflicts and delays that result in scheduling the operation, on the same shift, of as many as five different classes of equipment running over the track, namely, (1) drilling equipment, (2) cutting and shearing machines, (3) loading machines, (4) locomotives, and (5) mine cars (handling coal, waste, and supplies).

Description of Equipment

The so-called "shuttle car" is a four-wheeled unit, self-propelled, and equipped with a bottom conveyor so that the rear of the car can always be "spotted" or kept under the boom of the loading machine. As the rear of the car is loaded, the bottom conveyor is operated to carry the load forward in the shuttle car and thus permit the complete loading of the shuttle car without taking the car from underneath the boom of the loading machine. When the loaded shuttle car is trammed to the entry, it is unloaded by running the conveyor in the bottom of the shuttle car and the material is discharged onto a haulage belt-conveyor or onto a transfer elevator that fills the mine cars. (This arrangement makes a pit unnecessary.)

The rubber-tired cars now being installed may be operated by storage



Six-ton shuttle car on low ramp, discharging onto a transfer elevator which is loading a 2-ton mine car

Cable-reel shuttle car working in 5-foot coal seam, Red Lodge, Montana

batteries, electric cable and reel, or double trolley.

Various sizes of cars are being used depending largely on the height of the seam and the operating clearances of the mine workings. Ten-ton cars used in a Wyoming coal mine are powered by 48-cell 400 amp. hour storage-batteries and have rated speeds of 3 miles per hour loaded and 3½ miles empty. (Later models can be operated at higher speeds.) The overall width is 7 ft. 3 ins., the overall length 21 ft., 3 ins., the wheel base 8 ft. 6 ins., and the turning radius 22 ft., 6 ins. (With 4-wheel steering the inside clearance radius may be 7 ft., 6 ins., and the outside clearance radius 17 ft., 3 ins.) Each rear wheel is driven by a 7½ hp. 1750 rpm. 90-volt d-c motor. A third motor operates the flight bottom conveyor. Some cars have power on all wheels. The so-called 6-ton capacity car of the storage-battery type with batteries weighs 13,200 pounds, empty.

As previously noted, with this type of shuttle car the material may be discharged into an elevating conveyor which usually has sufficient capacity to unload the shuttle car quickly. The elevator discharges into standard mine cars (in trips) which are shifted quickly by a locomotive or room-hoist. The elevator itself may be mounted on a truck with steel wheels to run on the mine track, or on rubber tires, and may be self-propelled.

The distance the shuttle car travels to the transfer point or elevator is generally limited to 800 ft., with the round trip 1,600 ft. Assuming that the car travels at 265 ft. per minute and it requires ½ minute to unload, the round trip will take about 6½ minutes. This means 9 round-trips per hour at this distance. With two shuttle cars serving a loading machine, the output of the loading machine served by 5-ton shuttle cars would be limited to 90 tons, which is much below the capacity of the large machines. It is obvious therefore that the length of the haul must be kept to a distance that will permit the effective use of the loading machine, or a third shuttle should be available when the length of haul is excessive.

Belt Installations

In some of the most recent installations the shuttle car discharge directly onto a belt conveyor which may be as much as 2,000 ft. long. If several loading machines are operating on the same or opposite sides of an entry (or drift), each loading machine being served by two or more shuttle cars, it is possible to secure a very large tonnage, with minimum of conflict in transportation, by using shuttle cars discharging onto a belt. The gathering belt would, of course, be of sufficient capacity to carry away the contents of a shuttle car without delay and the belt would not be stopped when mine cars are shifted under the discharge end of the belt. Proper mechanical devices are provided to move cars quickly and, after a car has been loaded, to deflect the material into the empty car following while the trip of cars is being moved forward by a hoist or locomotive.

The recent use of shuttle cars discharging directly onto belts has aroused a great deal of interest. To date there are five installations of 30-in. troughed belt in various lengths up to 2,000 ft., driven by 40 hp. motors, at speeds of 400 to 510 ft. per minute. There is very little spillage at the loading point even though the shuttle cars of as much as 5 tons capacity are unloaded in 45 to 60 seconds.

Examples of Successful Operations

There are now more than 575 rubber-tired shuttle cars in operation in more than 25 different coal seams in the United States and more than 150 cars are on order. The greater number of these installations have been made in the last 2½ years.

Published data are available on various applications of shuttle cars in coal mines and certain types of these applications will undoubtedly be of interest to metal mine operators.

Illinois Coal Mines—One large com-

Ten tons of coal are hauled by storage-battery powered cars in a mine of the Sheridan-Wyoming Coal Co.

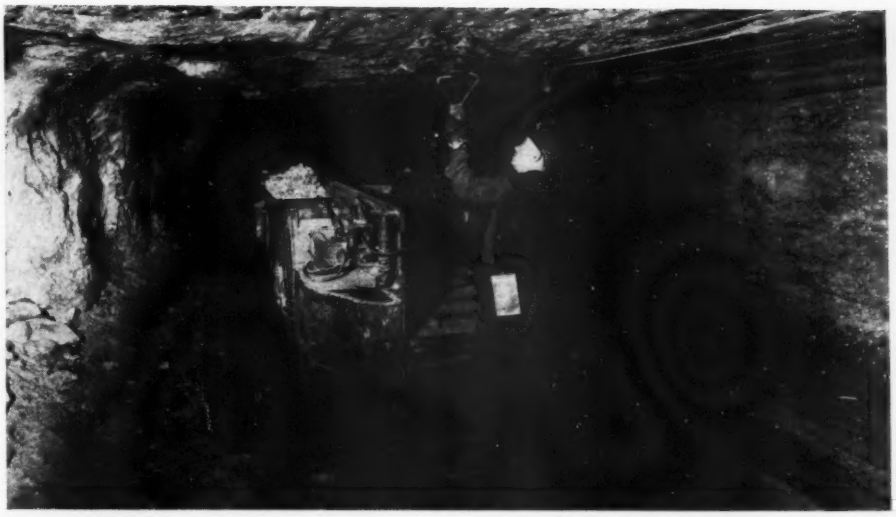
pany has 84 shuttle cars in operation in various mines and is responsible for the following statement:

"In all cases, except three mines, we have doubled the tonnage of the loading machine by the elimination of track and the installation of shuttle cars. The average track cost is six cents to seven cents per ton and the shuttle cars and auxiliary equipment can be maintained for much less than the track cost above. The approximate total maintenance of shuttle cars and auxiliary equipment, including battery depreciation of one cent per ton, is 4¾ cents per ton."

Tire wear has been very small, but as yet no data can be supplied that will have general application.

Heavy Local Grades—At a mine near Harrisburg, Ill., 6-ton shuttle cars are being operated in old haulageways where local dips make it impractical to operate with track transportation. Where the grade is over 12 to 15 percent, there is a small hoist at the top of the grade and with a ⅜-in. cable the shuttle car is pulled as much as 300 feet. By the addition of the one man on the hoist they have been able to maintain an average of 525 tons per shift with a 13-man crew.

At a coal mine in the Rocky Mountain region 4-wheeled shuttle cars of 6 tons capacity are being operated on heavy grades without any assistance from auxiliary hoists as noted in the preceding paragraph. Room-and-pillar mining is used with the panel entries driven directly up the pitch with the maximum grade of 16 percent in favor of the loaded cars. The cars are powered with storage batteries and there is no difficulty in handling the empty car up the grades. Four-wheel brakes are giving satisfactory service under these difficult conditions.

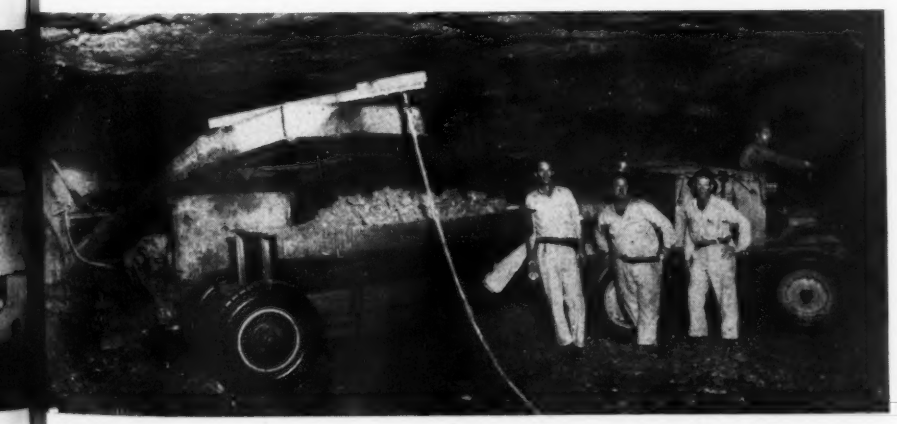


Combination trolley and cable-reel car in Union Potash and Chemical Company mine. Operator hangs the double nip when he changes from trolley pole to cable; when he changes back to trolley, the nip slides off the trolley wire and the reel takes up the cable automatically

Wyoming Coal Mine—The largest size cars now in service are those at the Monarch Mine of the Sheridan-Wyoming Coal Company. Seventeen men and a foreman work in a section and are responsible for undercutting, drilling, shooting, loading, timbering, ventilation, charging storage batteries, etc. "Three crews of this kind produce all the mine tonnage, except that coming from development. Each section is double-shifted, making six working crews. During the third month that this equipment was installed (one loading machine and two shuttle cars on each section) the average production of individual crews ranged from 614.6 to 699.02 tons and the overall average per shift for the month was 673.26 tons. By the close of the fourth month the peak output for any crew on a single shift had been 856.37 tons. These data are for operating shifts with no deductions for delays." (*Mechanization*, October, 1940, p. 26.)

1938	*Track Equipment* Tons Per Man	1938	*Shuttle Cars* Tons Per Man
July 15-31	17	Oct. 16-31	20
Aug. 1-15	16	Nov. 1-15	22
Aug. 16-31	18	Nov. 16-30	21
Sept. 1-15	15	Dec. 1-15	23
Sept. 16-30	14	Dec. 16-31	26
	Average ... 16.0		Average .. 22.4

West Virginia Coal Mine—Data on the experience of the Katherine Mine, near Lumberport, W. Va., were published in *Mechanization* in June, 1939, and are fairly representative of the experience of a mine in a seam 7½ ft. thick and equipped with 2½-ton mine cars. Details of the mining system, etc., cannot be reviewed in the brief time available but are readily accessible to anyone interested. The shut-



Six-ton drop-bottom tractor-trailer shuttle cars servicing caterpillar mounted scrapers in a lead-zinc mine

tle cars used held 5 tons and made possible an increase of the effective loading time of the loader from 185½ minutes, out of a 420-minute shift with mine cars, to 321½ minutes with shuttle cars. The car-changing time dropped from 92 to 68 minutes and the total delays from 167½ to 74 minutes.

A measure of the overall productivity of a crew is shown in the table on the preceding page by the tonnage data per shift per face-man.

Potash Mine—In a potash mine where the entries are 7 to 9 ft. high and 20 ft. wide and the rooms are 32 ft. wide, the ore is loaded by a caterpillar-mounted loading machine into shuttle cars holding on an average of 7½ tons. The car runs on four tires—two 9.75 x 20 tires on the rear wheels and two 7.5 x 20 tires on the front wheels. The car operates on 250 v.d.c., which it takes from the two-wire system overhead through a trolley-pole, the trolley contacting both (4/0 grooved) wires. The trolley wires extend along the entries from a raise into which the material is dumped directly, and to within several hundred ft. of the working face. At the inby end of the trolley system, the shuttle-car operator hooks down the trolley pole and connects the cable to the power lines on the roof. Each car carries an insulated cable wound on a reel capable of holding 750 ft. of the cable. Two shuttle cars serve one loading machine and can haul ore to the raise or waste material which can be taken into a worked-out room and unloaded on the floor. (*Eng. and Min. Jnl.*, April, 1941.)

Bottom-conveyor type of shuttle car unloading into a winze in a New Mexico potash mine

Important Current Developments

Limestone Mine—A new shaft-mine, developing a flat limestone bed by the room-and-pillar system, will be equipped with three 1½ cu. yd. shovels to load into Diesel-powered 8-ton Dumptor trucks. The trucks are the standard 4-wheeled rubber-tired trucks and each shovel is expected to produce 100 tons per hour. The limestone will be trucked to a 48 by 60 in. crusher located at the shaft bottom.

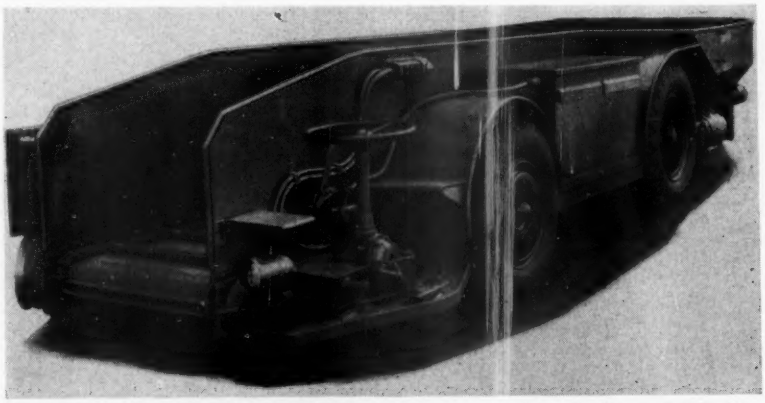
Salt Mine—A shaft mine in a flat salt bed will be equipped with bottom-dump tractor trailer units, powered with storage batteries, which will haul the salt loaded by a standard shovel operating on caterpillars. The salt will be hauled as much as 1,500 feet on a hard, dry, level floor with a maximum grade of 2 percent at the unloading point. The tractor-trailer, with Edison battery rated at 450 ampere hours, 58.2 kilowatt hours, will weigh complete 4.5 tons, and the trailer will have a capacity of 12 tons, making a gross weight loaded of 16.5 tons. The rated speeds are 7.8 miles per hour empty and 4½ to 6 miles per hour loaded. It is proposed to boost-charge the battery while the car is standing during loading periods. The manufacturer says there is no reason why existing trolley circuits cannot be used for charging batteries mounted on rubber-tired haulage equipment underground, in much the same manner as storage batteries are being used on combination trolley-battery locomotives.

Zinc and Lead Mine—At a new shaft mine 6-ton rubber-tired dropbottom cars have been installed to haul ore from caterpillar-mounted slushers to the shaft bottom. The equipment is of the tractor-trailer type with storage battery power. At present the total haul for the round trip is 700 ft.

Gypsum Mines—In shaft mines working a 48-in. flat gypsum bed, 6-ton storage-battery powered, four-wheeled cars are being installed. Entries are being driven 14 to 16 ft. wide and the rooms are 24 ft. wide; no pillars will be mined.

Essential Factors in Application of Shuttle Car Systems

In determining whether rubber-tired haulage can be used effectively



Storage-battery four-wheeled car with bottom conveyor to facilitate loading and unloading

Combination trolley and cable-reel shuttle car with bottom conveyor. Propelled by two 7½ hp. motors

Caterpillar mounted loader discharging into cable-reel 4-wheel 8-ton car with bottom conveyor. Material weighs 155 lbs. per cu. ft. in the solid

and in selecting the type and size of equipment that is best suited to do the job, certain physical factors must be considered, as they determine and limit the use of equipment which should be designed to fit the prevailing operating conditions.

The physical factors that must be considered include:

(1) The hardness and abrasiveness of the material and the size to which it will be broken.
(2) The amount and quality of water as it affects the floor conditions and the stickiness of the material to be handled.
(3) The dimensions of drifts, entries, rooms, and haulage ways, and the plan of mine lay-out as they may affect clearances and the maneuvering of equipment.

In designing or selecting equipment consideration must also be given to the following:

(4) Capacity and overall dimensions of the shuttle car,
  (a) in relation to the rate of loading and unloading,
  (b) in relation to the length of haul,
  (c) in relation to horizontal and vertical clearances,
  (d) in relation to haulage grades, and
  (e) in relation to motive power.
(5) Type and capacity of power units. At the present time four types of cars are in service, namely, storage battery, cable and reel, double trolley, and Diesel. Under certain conditions each type has some advantages.
(6) The ease with which the car may be steered and maneuvered, particularly at the loading and unloading points.
(7) Mechanical features, such as tires, wheels, and brakes.
(8) Safety features to protect the shuttle-car operator during loading, while driving forward and backward, and while turning.

In making a decision as to the economic desirability of shuttle cars, the following additional points must be reviewed:

(9) The net load of material that can be hauled at the lowest cost.
(10) The maximum and the most effective length of haul and

the number of shuttle cars required to give the best overall cost.

(11) The practicability of using the equipment to handle waste, supplies, tools, etc.

Possible Applications in Metal Mines

1. One of the outstanding advantages of this equipment, that is common to both coal and metal mines, is that, when it is necessary to continue hauling to the shaft or slope in old small-size cars, new sections of a mine may be equipped with large-size shuttle cars and full advantage can be taken of the capacity of modern high-tonnage loading machines. The shuttle cars, sometimes supplemented by large-size track cars, can transfer the coal or ore to the old cars (or cans) at designated transfer stations.

2. It is possible to clean up sections of old mines in flat beds without laying track and, having cleaned or levelled a floor for necessary height, it is possible to work in old sections of a mine without laying track except outby the transfer or loading stations.

3. It is practical to operate the type of equipment now on the market forward or backward, in openings 8 to 9 ft. wide, and to negotiate grades of 8 to 10 percent. For short distances the equipment is being operated on much heavier grades. With 4-wheeled-steering sharp turns can be made. When it is desired to use the units during the shift, or on successive shifts, on more than one level, the empty unit can be driven up and down heavy slopes connecting the levels. The trolley type of shuttle car is well-suited to operating under these conditions.

4. The shuttle car with a bottom conveyor furnishes a splendid unit for handling waste as well as ore, as it is possible to load waste mechanically whenever necessary and haul the waste to mill holes, or places to be filled, and discharge the waste mechanically. If necessary, the car may be run up a portable ramp and the waste may be piled until limited by the head-room necessary for the car.

5. When slushers are mounted on caterpillars, and moved about frequently on the mine floor, the shuttle cars can haul the ore from the slusher to the end of the regular haulage road or to pockets, winzes, etc. The slusher and the chain-and-flight conveyor have limitations as to distance through which they can function and the conveyor (except the shaking conveyor) is limited to a straight haul.

Self-propelled elevator to transfer material, unloaded by shuttle cars, into trips of mine cars

The shuttle car can well supplement slushers and conveyors, as it can function along roadways that follow the ore body or change direction for other reasons.

6. In developing a room-and-pillar system on flat beds, the shuttle car is very serviceable in turning room-necks, cross-cuts, etc. It is used to move supplies to the face, and, in mines where waste filling is brought in from the outside, can serve well in hauling waste from the shaft or station to points where track would not be required for other purposes.

7. By use of shuttle cars it is possible to project and operate a system of mining flexible enough to permit the blending of ore of various grades from different working places on the same level or from different benches.

The metal-mine operator will probably find many other applications for a rubber-tired self-propelled, self-unloading unit of the type which has been used so successfully in coal mines, and undoubtedly units of various sizes, including units much larger than those now being used in the coal mines of Wyoming, as well as narrower and smaller units, will be developed by the manufacturer as soon as he knows more specifically what the metal-mine operator requires.

Southern Coal Operators Charter Association

A charter was recently granted by Secretary of State William S. O'Brien of West Virginia for the Southern Coal Producers Association, Inc. This association of southern coal operators, including those in southern West Virginia, Kentucky, Tennessee, and Virginia, has been chartered to bargain collectively with the United Mine Workers of America. The formation of the association is the outgrowth of a split among coal operators last spring over a new bituminous wage contract. The new organization includes the 13 district associations which bolted the Appalachian operators' conference at that time and carried on separate negotiations with the union. When the southern operators withdrew from the wage negotiations it was over the question of whether the southern industrialists would surrender their traditional 40-cent wage differential which is needed, they contend, in order to offset the freight advantage possessed by northern fields. Those who signed the charter application were: M. L. Wotiz, S. H. Harrison, H. C. Gluesenkamp, E. V. Evans, and M. M. Garges, all of Charleston, W. Va.

Minerals Yearbook Released

The new edition of Minerals Yearbook, prepared and published by the U. S. Bureau of Mines and comprising a review of the year 1940, was issued in September. The Minerals Yearbook is a well-known reference work and statistical record of the mineral industry and this new volume in the series, containing 72 chapters, prepared by nationally and internationally known specialists in the field of mineral economics and technology, presents the most thorough and detailed study of its kind. All of the minerals classified as strategic or critical in the national defense program received special consideration, and much information relative to such minerals heretofore unavailable is published for the first time.

Coal Seam Developed

The Gulf Smokeless Coal Co., operating in the Beckley seam at Tams, W. Va., is erecting a large and modern tipple, making ready to start development of a mine in the No. 3 Pocahontas seam. Future production will come from both seams.

BUCKET LINE DREDGE METHODS

Steady progress has been made in the development of bucket elevator dredges. Refinements and improvements have been made in design and supplemental equipment is more widely employed. As a result the field of application of these dredges is also being widened and larger quantities of gravel are being made available.

By NORMAN CLEAVELAND
General Manager
Roaring River Gold Dredging Co.

IN 1899 the California Miners' Association published an elaborately bound and illustrated volume of some 500 pages entitled "California Mines and Minerals." This book served as a souvenir for a national convention of the American Institute of Mining Engineers which was held in California during September and October of 1899. The Risdon Iron Works of San Francisco supported this book with a full-page advertisement which consisted of a photograph with the following description, "RISDON GOLD DREDGE." "This highly successful dredge is the evolution of 30 years, each succeeding dredge being an improvement upon its predecessor, until absolute perfection seems to have been reached in the Risdon Gold Dredge.

"There is no other method by which ground can be handled so cheaply, whether in river or where seepage is sufficient.

"The buckets are water-tight, saving all the gravel while the bucket is being elevated. Has the best possible hopper to wash and properly treat the material which is dumped into it intermittently in large quantities. The gravel passes over the tables or gold saving devices in an even and uniform stream, so nothing is lost. Can be operated at a cost of three cents per cubic yard. Manufactured by The Risdon Iron Works, San Francisco, Calif."

From the above, it doubtless seems presumptuous of me to discuss "Bucket Line Dredge Methods" when "absolute perfection" had apparently been obtained 43 years ago. Perhaps it would be more becoming to discuss the retrogression in Bucket Line Dredge Methods, for even though present-day gold dredges have buckets which are water-tight, there are probably no operators or manufacturers so bold as to maintain that any present-day dredge equipment has "the best possible hopper to wash and properly treat the material"—"so nothing is lost." And, present-day dredge operators doubtless all would be on relief if survival depended upon maintaining an operating cost of three cents per cubic yard.

The Risdon gold dredge, described as "absolute perfection" in its day

However, it is well to point out that the first successful gold dredge in California was built near Oroville, Calif., by the Risdon Iron Works in 1898 for the Feather River Development Company which was organized by W. P. Hammon and Thomas Couch. The design of this dredge had been brought to this country by R. H. Postlethwaite, a native of New Zealand, where gold-dredge machinery had been used and developed since about 1868.

In any discussion of the historical aspects of dredge development in this country, due consideration must be given to the operations at Bannack, Mont., where a successful bucket line dredge was built and operated in 1896. The design of this equipment was the mining adaptation of the bucket elevator dredges which had operated for a number of years previously on the Chicago Drainage Canal and which had been built by the Bucyrus Company who, later, were to furnish much equipment for California dredge fields.

Gold dredge development, particularly as regards the treatment of material, followed the principles incor-

porated in the early California dredge more closely than those of Montana.

Early California Dredges Refined New Zealand Practice

It was by refinement in design of the early New Zealand dredges that the California type of gold dredge was developed which eventually set the standard for dredge design in most of the dredge fields of the world. That the Risdon Iron Works did not maintain its position of dominance in California dredge fields may be explained by the apparent conviction of both themselves and their New Zealand engineers that their equipment was absolutely perfect.

In a paper given before the San Francisco section of the A.I.M.E. in April, 1921, Newton Cleaveland, an early associate of W. P. Hammon, pointed out that the fundamental design of the Risdon dredge had been altered but slightly. Fundamentally, it consisted of a floating barge upon which was installed:

1. A line of excavating buckets (water tight) operating over upper and lower tumblers and supported by a ladder which, in turn, was pivoted from the upper end and suspended from the lower end by blocks and cables.

2. A scrubbing and screening device consisting of a trommel into which the excavated material was dumped and in which the material was washed by jets of water pumped from the dredge pond.

3. Gold-saving tables over which the fines from the trommel were sluiced and upon which the gold was recovered.

4. A conveyor which received and stacked the oversize material from the trommel.

5. A multi-drum winch by which a single operator could control the movements of the dredge.

Thus, it would seem that even though the Risdon Iron Works was undoubtedly extravagant in its claims of producing an "absolutely perfect" dredge in 1899, the fundamentals of its design were sufficiently perfect to have survived almost intact except for the method of holding the dredge against the digging face.

The early Risdon boat followed the New Zealand practice of using a headline. It developed that the spud was superior to the headline for California conditions. It is this adaptation of the spud and the proper method of operating with the same, plus extensive refinement in design such as the introduction of the close-connected bucket line, the belt conveyor and the generous use of alloy steels, which amply justifies a distinction being made between the New Zealand and California type of dredge.

Over Two Hundred California Bucket Elevator Dredges

There have been over 200 bucket-elevator dredges manufactured in California for world-wide use. Over 100 such dredges have operated in California and have handled, according to reliable information, about 2,170,000,000 cu. yds. of material up to and including the year 1940. Two billion, one hundred seventy million does not seem like a very large figure these days, so to make it more comprehensible to dredge operators, the writer will lay things end to end: Assuming that a dredge with a capacity of 3,000 cu. yds. per day had operated every day since the beginning of the Christian Era, the total yardage handled still would be slightly shy of 2,170,000,000 cu. yds., and if this dredge had recovered $3.33 per cubic yard, of $10,000 per day in gold every day for the past 1,941 years, it would have produced just about enough money to pay for the first Lease-Lend bill alone.

The gross value of gold produced by all the bucket-line dredges in California from 1898 up to and including 1940, as given by Charles M. Merrill of the United States Bureau of Mines, is $279,699,074. This gives an average value of 12.9 cents per cubic yard for all ground handled to date.

New Type of Dredge is the Becker-Hopkins

It is refreshing to find that present-day operators of dredge equipment, after 43 years of development, are sufficiently unconvinced as to the perfection of their dredges to adopt such radical departures as the dragline dredge, whose success is no longer a matter of conjecture. The Yuba Manufacturing Company, which has played such a prominent part in the development of the California type dredge, has recently manufactured the first of its Becker-Hopkins dredges for California service. This dredge is now operating on Butte Creek and is being watched by the dredging fraternity with the greatest interest.

The Becker-Hopkins type dredge was developed and has proven successful in Alaska service. It differs from the bucket-elevator dredge primarily in its excavating equipment, which is a single bucket mounted integrally with a digging boom similar to that on a power shovel, except for the fact that when elevated the material slides out of the bucket and down the boom into a conventional dredge trommel. From there on, the treatment of the material is according to well established dredging practice. These Becker-Hopkins dredges do not swing on a spud, but are held against the face by cables which also serve to move the dredge sidewise across the face. In their present stage of development, the digging depth of these dredges is limited to about 25 ft. They have the advantage of a lower first cost than the conventional bucket elevator type, being comparable to the cost of a dragline dredge of equivalent capacity. Under some conditions, such as high water and floods, the Becker-Hopkins dredge would have a decided advantage over the dragline type, because it is a self-contained unit on a single floating barge.

Sectionalizing Simplifies Erection and Removal

The sectionalizing of hull, gantries, ladder, stacker and housing for simplified erection in the field, has been widely adopted during the past decade by California dredge manufacturers. The Washington Iron Works in their initial appearance in California dredge fields made a particularly noteworthy demonstration of the effectiveness of careful design in the selectionalizing of the entire dredge structure. During August, 1940, the Washington Iron works built a 4½-cu.-ft. dredge weighing 420 tons at French Gulch, Shasta County. Only 30 days were required for erection from the time the first pontoon was set until the dredge started digging. The house panels were built in the field and required about three days for installation. Four thousand, one hundred fifty man-hours, or an average of about 138 man-hours per day, were required to complete the field erection of this dredge. A corresponding saving in time and material doubtless will result when it becomes necessary to move this dredge.

Supplemental Equipment Aids Dredges

Probably the most significant development in recent California dredge practice is the increasing use of supplemental excavating equipment to aid and simplify dredging problems.

California dredging fields are far from depleted. In fact, bucket-line dredges produced 414,966 fine ounces of gold in 1940, the highest dredging production in the state's history. However, it is only natural that after 43 years and 2,170,000,000 yards of dredging, the cream of the dredging deposits is gone, and the 45 dredges now working in California will be faced with increasing complications to maintain their present output.

During the past decade, the track-laying tractor, equipped with a bull-dozer, has become almost an essential adjunct to dredging equipment. The development of earth-moving equipment centering largely around the tractor has been tremendous in the past few years, and we now are learning that the carry-all, the scarifier and the dragline are increasing the scope of future possibilities of dredging and are being included as essential adjuncts to dredge operations. In this connection, it is interesting to note a statement by C. M. Romanowitz and H. A. Sawin, in their paper given last year at the Mining Congress Convention at Colorado Springs. This paper states that the tractor and bull-dozer combination was successfully built and used for the first time by the Natomas Company about 25 years ago in some of that company's re-soiling efforts.

Charles Patmon was probably the first operator in California to use tractors for stripping and tailing disposal as an essential adjunct to dredging operations at Lancha Plana, Calaveras County, California.

Other notable uses of tractors and associated earth-moving devices as an essential adjunct to dredge operations have been made by the Gold Hill Dredging Company at Loomis, California, by the Camanche Placers, Ltd., at Camanche, Calif., by the Tuolumne Gold Dredging Co., at La Grange, Calif., and by the Roseville Gold Dredging Company at Roseville, Calif. One of the most interesting operations of all, however, is that of the Manhattan Gold Dredging Co. at Manhattan, Nev., where a particularly noteworthy use of tractors, bulldozers, scrapers, carry-alls, and draglines on a large scale has resulted in the surmounting of some very severe conditions.

The Manhattan Dredge at Manhattan, Nev.

The Manhattan dredge is operating in historic Manhattan Gulch about 40 miles north of Tonopah, Nev. This

Modern bucket-line dredge in California

Gulch averages about 450 ft. in width, and is bounded by slate-rimmed benches which rise abruptly from 30 to 50 ft. on either side. This gulch empties out onto an alluvial fan of a typical desert valley. Dredge operations commenced well down on the fan and extended up into the gulch proper with an average grade of about 3½ percent.

During the first year of operations the pond was widened from 400 ft. to 1,000 ft.; at times there was not room under the double stackers for the tailings and a dragline had to be used for several hours a day to keep the stackers clear.

As the mouth of the gulch was approached, it was necessary to lower the water level in order to reach the lower channels. The overburden on the south side became so thick that it was necessary to strip up to 40 ft. of it in order to reduce the bank above water from 60 ft. to 20 and so enable the dredge to stack the material. The stripping was done with cats and carry-alls.

Another need for auxiliary excavating equipment arose a little above the mouth of the gulch. A hitherto undeveloped channel was found on the south side, the bedrock of which was about 75 ft. higher than the bedrock of the deepest gulch channel; the high channel could not be reached by the dredge. Its pay was largely near the bedrock; the overburden of this high channel was stripped to waste; the pay gravel, of a thickness of 10 to 15 ft., was carried out into the gulch by the carry-alls and dumped in the path of the dredge. Stripping of overburden was usually carried on by D8 caterpillars towing tandem 14-yd. carry-alls; the pay gravel was firmer and usually required the use of one caterpillar booster to three tandem scraper rigs. Very little rooting was done. Potholes in bedrock had occasionally to be cleaned by hand. Rims of schist bedrock usually separated the high channel from the gulch.

Sections of the same high channel occur for two or three miles up the gulch; they are prospected by shafts, well in advance of the dredging, and the pay gravel dumped in the path of the dredge. In places, 20 to 30 ft. of pay gravel from the bench channel has been piled up above the original surface of the gulch and has added materially to the output of the dredge.

Operation at Poverty Hill

Another operation of outstanding interest that may well point the way for the use of dredge equipment to vast new fields has just gone into production at Poverty Hill, Sierra County, Calif. This operation is under the management of the Walter Johnson Co., who have moved the 6-ft. dredge they built six years ago for the Arroyo Seco Gold Dredging Company from Ione to Poverty Hill. This is the first large-scale effort to mine these high channels in California with dredge equipment.

Poverty Hill is on a part of the La Porte channel lying between Slate Creek and Scales and has an elevation of about 4,500 ft. Poverty Hill was one of the 13 mines originally enjoined and shut down in 1884 by the anti-debris litigation. The old-timers worked a portion of the channel for an average width of about 700 ft. and for a length of about 2,000 ft.

Other workings and prospecting indicates that there are probably 4,000 ft. of virgin channel still remaining on the property. The grade of the bedrock on this channel is fairly uniform being about 100 ft. per mile. The surface, of course, follows the present topography of the region, resulting in gravel depths varying from 40 ft. to 140 ft., with an average of about 90 ft. The pay gravel is confined almost entirely to a 20-ft. section above bedrock, the upper gravels containing in the neighborhood of 3 cents per cubic yard.

A large deep-digging dredge could probably handle this deposit without the assistance of auxiliary excavating equipment. However, there is insufficient yardage to justify such an installation.

At present, a selected portion of the channel varying in width from 300 ft. to 400 ft. is being mined. This portion of the channel is being stripped to a depth of 45 ft. above bedrock. The stripping is being conducted with Caterpillar tractors and Le Tourneau carry-alls; Le Tourneau Tournapuls have also been used as well as a power shovel and trucks having a capacity of 4 cu. yds. The bottom 45 ft. are being dredged. The dredge has facilities for handling tailings and sand considerably in excess of normal. The bedrock is a schist, the surface of which is decomposed sufficiently to permit digging to a depth of 3 to 4 ft. The dredge has a capacity of about 5,000 cu. yds. per day. The gravel washes freely; there are very few boulders and the slimes settle quickly. According to Walter Johnson, 1,000 g.p.m. is an ample water supply to the dredge pond, and the dredge could probably get along on 500 g.p.m.

Consideration is being given to the possibilities of hydraulicking off portions of the overburden and storing the tailings in the recently constructed dam on the Yuba River during periods of high water when the problem of water discoloration is not acute.

Tremendous Quantities of Gravel Still Available

The California State Mining Bureau Bulletin No. 92 entitled, "Gold Placers of California," by C. S. Haley, published in 1923, gives the amount of auriferous gravel present in the Sierra Nevada as about 7,000,000,000 cu. yds., of which 4,000,000,000 could probably be worked by hydraulicking, if such were legal, with a gross recovery of about 15 cents per cubic yard. This operation at Poverty Hill may be the beginning of considerable new developments in California placer gold production. As an indication of what may develop we can look to the stripping operations of the United States Smelting and Refining Co., on Ester Creek, near Fairbanks, Alaska, which is well known to mining men. Here, in addition to stripping some 45,000,000 cu. yds. of muck and topsoil by hydraulic giants, a 12-yd. Bucyrus-Monighan is in the process of stripping some 15,000,000 cu. yds. of barren material at the rate of about 8,000 yds. per day. This stripped material is transported on a system of belt-conveyors as far as 8,000 ft. for disposal. Costs per cu. yd. are said to border dredging costs.

Another significant use of the belt-conveyor is in connection with the construction of the Shasta Dam where aggregate for the concrete mixing plant is transported about nine miles on belt-conveyors at a reported cost of 8 cents per cu. yd.

Pollution and Tailings Disposal are Vital Problems

The vital problem of pollution and tailing disposal becomes much less formidable when the ground is handled by mechanical means rather than hydraulic. Hydraulicking experience in California indicates that only under the most favorable conditions are less than 2.5 g.p.m. of water required to handle a cu. yd. of gravel per day. This figure is based on a water duty of about 4 cu. yds. per miner's inch of water. Thus, a hydraulic operation handling 10,000 cu. yds. per day will require a continuous water supply of at least 25,000 g.p.m. On the other hand, if 10,000 cu. yds. per day of these typical tertiary gravels were handled by mechanical means, assuming half of which would be overburden to be stripped, and half to be handled through a dredge in a normal dredge pond, a water supply to the dredge pond of 1,000 g.p.m. would be sufficient. As dredge operators well know, there is no particular difficulty in controlling their slimes when they do not exceed 1,000 g.p.m. To keep 25,000 g.p.m. of slime laden water out of natural drainage systems is quite another matter.

Bucket Elevator Dredges Have Wide Field of Use

The thoroughness with which a bucket-elevator dredge can clean bedrock, coupled with its ability to keep clear of its own tailing and the limited amount of water required to make a highly satisfactory gold recovery, and, above all the economy of its operation leads the writer to conclude that the bucket-elevator dredge will see much service in these Sierra Nevada deposits. The next most useful piece of equipment will probably be the belt-conveyor onto which overburden will be fed by draglines, power shovels, tractors, scrapers, etc.

It has not been the writer's intention to discuss in detail the numerous refinements and improvements that are constantly being made to bucket-elevator dredges. Fortunately, the technical press and capable engineers have covered most of these developments in numerous articles and papers. The writer has confined himself to what he considers pertinent, and some impertinent, facts about the development of bucket-line dredges in California with particular emphasis upon possible future developments. The writer does not see much reason for the placer miner of today particularly to envy the opportunities which faced the Forty-niners.

There is still plenty of gold "in them thar hills," and while bucket-line dredges in the past have not ventured out of the lowlands, the future may see them going from precipice to precipice, with the able assistance of other forms of dirt-moving equipment. Potentially, there is from two to three times as much ground in view as has been worked during the past forty-three years, and there should be ample incentive for manufacturers and operators alike to re-double their efforts toward developing the perfect dredge.

West Virginia Safety Meet

The 13th Annual State-Wide West Virginia Safety Meet was held at the auditorium in Charleston on October 25. Competing teams were those winning in previous sectional meets held throughout the state during the summer. Following the safety competition, team members and officials of the various mining institutes participating attended a dinner in the auditorium, followed by a floor show.

The winning teams were those of the Pardee and Curtin Lumber Company mine at Webster Springs, and the Negro team from mine No. 63 of the Consolidation Coal Company of Monongah. Twelve teams participated.

Install Belt Conveyor

The Cleveland-Cliffs Iron Company is installing a belt conveyor system to transport ore from the pit of the Hill-Trumbull iron mine to the concentrator at Taconite, Minn., similar to the one at the Canisteo mine.

Effect of *Government Controls* on Exploration For Mines

Government controls, such as excessive taxation, Wage-Hour restrictions, SEC regulations and others have had a serious restricting effect on the exploration for new mines. Mr. Snyder, a "rugged" individual in an industry which is by circumstances and tradition necessarily ruggedly individual, expresses the viewpoint of many of those responsible for the development and operation of mines.

By EDWARD H. SNYDER
General Manager,
Combined Metals Reduction Co.

VARIOUS speakers at meetings of the Mining Congress held during the past eight years have done a good job individually and collectively of analyzing for you the handicaps placed on the mining industry by federal and state legislation.

The excellent information furnished at regular intervals by our Secretary coupled with the information available to you through several first class information bureaus makes it unnecessary for me to single out for analysis any particular "mistaken idea" of "Rust Legislation" or the administration thereof. The fact that you are here instead of being in Washington, in court, in jail, or back on your job endeavoring to find ways and means of liquidating back wages for men you never employed, is evidence that you have probably kept up with your daily reading assignments.

Government Controls Retarding Mine Development

I will summarize briefly the more serious government controls on mine development, and my suggestions as to what should be done to correct their ill effects, with the hope that doing so will assist in finding ways and means of increasing metal production and at the same time cure the creeping paralysis that is slowly destroying certain parts of our industry.

The development of mines has always been an extremely hazardous business for both capital and brains, but an essential one for the growth and health of the nation.

Security and Exchange Act Restricted "Risk" Capital

During the rush to pass the Security Exchange Act, the need of pumping money into new enterprise was forgotten when the machine gun placements were constructed to annihilate the stock gamblers. Unfortunately, more legitimate businesses including financing of prospects, were in the line of fire than there were crooks, and an important source of "risk" capital for mine development was destroyed. Strenuous efforts on the part of our western Congressmen resulted in amendments to the act to afford protection against this fire by exempting from registration mine promotions up to $30,000. These concrete safety zones were soon covered by imponderable regulations and were far too small to be of material help, and individuals who respected their reputations promptly decided that obtaining money from the sale of stock to the public involved risks they dare not take. I know of no important mine development that was financed during the past eight years by the sale of stock to the public.

In all fairness, it should be stated the Security Exchange Commission recognized this problem last year; they liberalized and simplified regulations and now exempt from registration the financing of prospects up to $100,000. This may ultimately help restore activity at small properties, but in no way offsets the loss of development during the past eight years.

A more important and better source of capital for mine development than public financing was formerly the "risk" money supplied by wealthy individuals to whom the romance of mining appealed. These men generally furnished not only money, but along with it organization, brains, and courage. This source of capital was practically destroyed by the excessive high bracket taxes. Few wealthy individuals are now willing to fight the natural risks and labor problems incident to mine exploration with a tax structure such that the net money they may retain from a successful mining venture is substantially the same as can be had from a conservative investment in bonds. In other words, "the house rake-off" has destroyed the game as far as this type of capital is concerned.

Mine Exploration All But Stopped During Depression Period

With outside financing at a minimum, the question arises as to what the

established mining and smelting companies have done during the past ten years in the way of exploration. The increase in the price of gold and the government purchase of domestic silver stimulated the development and production of precious metals from "dry" ores and helped to prevent complete shutdown of many lead and zinc mines. However, with the exception of the year 1937 and the period since the outbreak of World War II, the domestic nonferrous metals industry, as a whole, was too sick during the past ten years to make any bets on the future. As a result, developed ore reserves in lead and zinc mines and underground copper mines are at present inadequate to supply the needs of the nation, and we are now leaning far too heavily on uncertain foreign sources for concentrates and metal.

In spite of the present and growing demand for metals, exploration for mines is still materially less than it was during the ten-year period prior to 1930. This is not strange when the fundamental relations between costs and metal prices are understood. With fixed costs, an increase in metal prices automatically converts substantial quantities of mineralized rock to ore and makes available for extraction the metal content thereof. With fixed metal prices, an increase in costs automatically converts marginal ore to mineralized rock. Mining costs for underground mines are now from 30 to 45 percent higher than they were in 1929.

Plant at Bauer, Utah, of Combined Metals Reduction Company

Caselton shaft, Pioche, Nevada

Metal Price Increases and Relief from Handicaps Needed

In view of this, the nation's present and growing needs for metal makes mandatory that the prices of the nonferrous metals be increased in an amount in excess of that required to maintain the existing differential between costs and metal prices. In other words, the increase in metal prices must more than offset the certain increases in costs the industry is now facing. It should be noted, however, that relieving the industry of some of the handicaps with which it is now contending would decrease costs. The more serious of these handicaps are:

(1) That part of the National Labor Relations Act and the administration thereof that makes it unsafe for an employer to have freedom of speech. This act should be amended to insure the employer his fundamental right to present facts to his employes individually and collectively, and thereby protect the workmen, the industry, our Congressmen and the nation from coercion and the terrific waste now rampant throughout the land due to uncontrolled labor racketeers.

(2) The maximum hours provision of the Fair Labor Standards Act that has added severely to the cost of operation at all mines, reduced operations to five days per week at many properties and thereby greatly increased overhead costs, confiscated 20 percent of the working time of employes, reduced their yearly earnings by $300 to $400 per year, created a shortage of labor at this time, and added to the housing problem in isolated mining camps.

(3) The indefinite regulations of the Wage and Hour administrator and state agencies that have destroyed "block leasing," and with it the exploration and substantial metal production of a high class of intelligent individuals who have the necessary courage to make mines.

(4) The interpretation of the Wage and Hour Administration and some state laws that have reduced the effective working time of an underground shift to six hours in metal mines, increased costs and the number of men required to maintain production.

(5) The combination of the five-day week created by the Fair Labor Standards Act and the Social Security

Act that makes it desirable for certain types of miners to enjoy 20 weeks vacation per year at a rate of $85 per month. The arithmetic of this was recently disclosed by a miner who in substance stated 22 days per month at $6.45 per day gives $141.90, O. A. B., transportation to the job, union dues and working clothes add up to $17, leaving $125. Unemployment insurance pays $85; why work for $40 per month instead of going down on the ranch to enjoy the fishing?

(6) Taxes and the uncertainties connected therewith. This subject is far too broad to be discussed in detail in the time available. However, I wish to register a few fundamental facts as to the effect of taxes on exploration.

(a) State and Federal taxes now total in excess of 50 percent of the net earnings for many mining companies.

(b) A company with a portion of its income already subject to the 60 percent excess profits tax has no good reason for increasing production at the expense of its ore reserves.

(c) The excess profits tax in the form recently enacted will result in less revenue for the government from mines than a more moderate tax that would have stimulated exploration and production of metals.

(d) The action of the House Committee in striking the tax exemption on excess profits derived from the production of strategic minerals will, in my opinion, not only reduce the government's revenue, but greatly increase the governments cost of supplying its needs of these metals. This action also destroys the confidence of the miner in his government and further restricts his desire to bet on the future.

(e) The tax collector's "take" is one of the fundamental reasons adequate capital has not been available for the development of prospects during the past ten years.

(f) Unless the main objective is to destroy private ownership of mines, our federal tax laws should be simplified to the point where at least a majority of our Congressmen could understand them. This simplification would give the miner a better chance of guessing his tax liabilities, and at the same time result in a fairer distribution of the cost of government.

A Rational and Realistic Governmental Policy Will Stimulate Production of Metals

Please note that every one of these six problems of increased expense can be solved without cost to the government except for the short time required for the agencies involved to determine facts as they are and not as some political zealots imagine them to be.

As to the matter of fixed metal prices, we cannot quarrel with OPACS's desire to control inflation, but we sincerely hope its combat with natural laws and a mass of human nature far greater than the one that sank Prohibtion will not cause it to delay too long the inevitable upward adjustment of metal prices to meet the certain increases in costs which will result from the present growing demand for labor and materials.

If the non-ferrous industry is to maintain its present rate of production, it must have metal prices not only sufficient to warrant an increase in development, but also adequate to make possible the payment of wages high enough to stop our labor from moving into less essential industries.

This suggestion is made on the assumption that the government will not fix all prices and *wages*, and that inflation will be with us in ever increasing force for some time.

In closing, I wish to point out that effecting the changes in governmental policies that are necessary to permit the non-ferrous metal industry to meet the country's metal needs is too big a job for your hard working officials without your energetic cooperation. I sincerely recommend that each of you analyze the trend of events, and relentlessly furnish facts to your communities and your representatives in Congress, unless you have reconciled yourself to working directly for the government instead of three to four days per week as at present.

— *Discussion** —

By ROSS D. LEISK
General Manager
Sunshine Mining Company

MR. SNYDER in my opinion has said it all. He has given us the story concisely and to the point, and there is very little that I can add to it. There are some things that I can emphasize, but I agree with everything that he said. The subject of his paper is "Effect of Government Controls on Exploration for Mines" and it is a broad subject, but boiling it all down, it seems to me the effect of every one of these controls he has discussed is to curtail drastically what I would refer to as the real pioneering phase of mining exploration. We know that it curtails new development all along the line, but I think that it hits hardest right at the starting point, the finding of new mines. Why does it do it? Why do these controls have that effect? Simply because they take the hay away from in front of the horse. How can that be remedied? By putting the hay back.

If there is no incentive to take the risks of finding mines, we are not going to have very many new mines. Now, of course, the question of how to put the hay back before the horse, is where the rub comes. Most of these controls come as parts of broad enactments of legislation, acts of Congress that affect all of our industries, affect everyone in the country one way or the other, and before mining and exploration for mines can get relief from the effect of these controls, we need changes in the legislation that will not be primarily in the nature of being designed merely to furnish relief to the mining industry, but to correct the real troubles that are doing the damage, not only to mining, but to all of our industries.

Mr. Snyder referred to three types of mine exploration and the financing for them. The first one was the new company in which the financing is done by the sale of stock, and where subscribers to that stock are generally not experienced mining people; and very often the people directing a new mining company are not particularly ex-

* Presented at the convention of the American Mining Congress, San Francisco, following Mr. Snyder's original paper.

Surface plant of the Sunshine mine

perienced in the game. That type of exploration was pretty well put out of the picture by the body blow it got under the SEC. While there now is some relief in sight in SEC regulations, the change in the tax picture makes it rather evident that the finding of new mines by financing through the sale of stock is just about as bad off as it was when the SEC had it under such tight control.

The second type of financing mentioned was the money that came from individual capitalists—if you want to call them that. In other words, the fellows who had money and could afford to gamble and lose, and who elected to engage in that business.

The other type of financing, of course, comes from the operating companies practically all of whom have their exploration departments for the purpose of uncovering new mines and extending known ore deposits, to make up for the exhaustion of already-explored ore reserves.

It seems to me, going back to what I call the real pioneering phase of exploration, that the effect of all this upon the new company financed by the sale of stock is the most serious. Practically all of our present successful mining operations started out in that way. They brought new money and new blood into the mining industry; some of them succeeded and grew into what they are today. Our exploration departments are usually better financed than these companies dependent upon the sale of stock, but at the same time they have to be pretty realistic and hard-headed about the way in which they risk their money for mine exploration. Engineers and operators must place certain limitations upon the degree of risk that they will subject their company's exploration money to. The new company organized and financed by the sale of stock for the specific purpose of spending the money on a certain property does not have quite the same limitations; it may be wild-cat prospecting, but that wild-catting has a very definite place in the finding of new mines. You don't have to look back far in mining history of the West to find that many rich ore deposits were discovered by capital of that kind, and discovered largely because those who supplied the capital were inexperienced and took longer chances than a hard-headed mine operator or geologist would have felt justified in taking.

Our exploration departments will continue, of course, to try and find extensions of our known ore bodies and to take on other ventures, but I do think that the finding of new mines is being put under the greatest handicap by the effect of the various Government controls, in making it practically impossible for the small company financed by the sale of stock to remain in the picture.

The two most serious things affecting this search for new mines I think are the ones of taxation, primarily the mis-named excess profits tax—and the other the maximum hours limitation of the Wage and Hour Act, which is constantly disrupting operations and raising costs in the isolated districts. The fact that our new tax law removes the exemption from the excess profits tax on strategic minerals, aside from destroying the incentive for further search for strategic metals, is, I think, an act of bad faith on the part of our law-making bodies. When strategic minerals were declared exempt from the so-called excess profits tax a year ago it was naturally assumed that the exemption would hold for the duration of the emergency, and in this belief many people spent money, made commitments and substantial investments in the development of strategic mineral properties. They now find out that under the new law the exemption is taken away, with the result that in many cases their chance for recovery of capital investment looks rather hopeless.

The only answer to these things as far as I can see is in the reversal of the processes by which they came about; they came to us by the action of Congress, and in those actions many Administrative Agencies were given broad powers, which powers all seem to be working against us in some way. I don't think we can hope for very much relief through the discretionary powers of the Administrative Agencies.

It seems to me our only hope, if we are to remove some of the restrictive effects of Government controls upon the finding of new mines, is to get that relief through correcting some of the things that are wrong with the existing statutes.

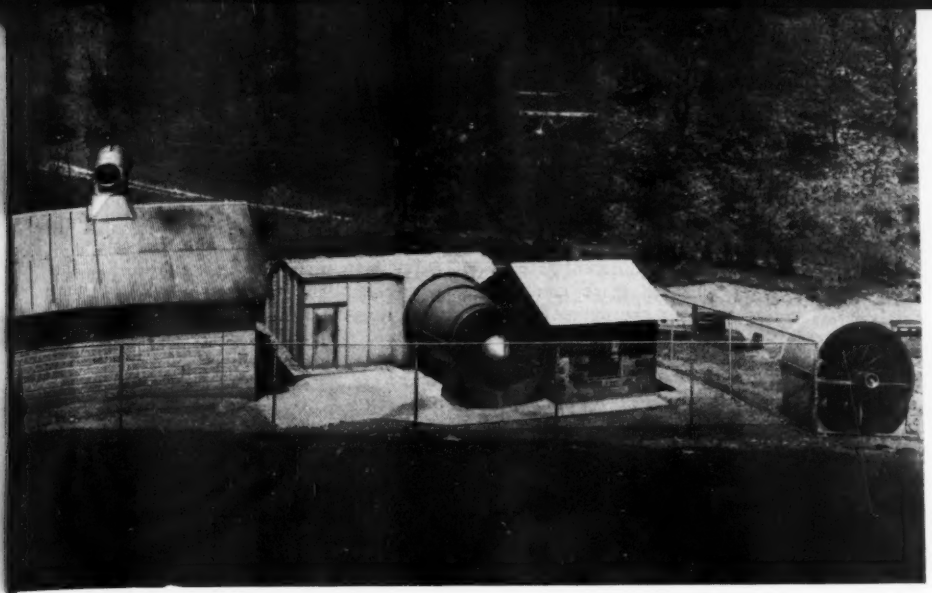
Homeowners Can Save Fuel

Through proper maintenance of furnaces and more efficient firing methods, homeowners and operators of apartment and office buildings can save more than $150,000,000 in fuel bills each year, according to estimates made by the Fuel Economy Section of the U. S. Bureau of Mines.

Director R. R. Sayers recently reported that 10 percent and probably more of the total fuel (including coal, coke, gas and oil) generally used in the average American home and office building can be conserved by better attention to domestic heating, thereby making available a greater proportion of freight cars, trucks and other forms of transportation for the movement of vital defense materials.

It is estimated that 10,000,000 tons of coal (bituminous and anthracite and domestic coke) alone could easily be saved by domestic consumers. This tonnage is equivalent to the freight hauled by 200,000 acerage railroad coal cars, or 140,000 railroad cars and 1,500,000 two-ton trucks.

In addition to the money savings to themselves of about $80,000,000 to $100,000,000 a year, domestic consumers of coal and coke would be helping the nation to conserve a valuable mineral resource and at the same time obviate any possibility of shortages.



A modern fan installation, Elm Grove, W. Va., to provide adequate mine ventilation

Aspects of UNDERGROUND VENTILATION*

By RAYMOND MANCHA
Jeffrey Manufacturing Company

The requirements of mine ventilation are, first: that an adequate flow of air be maintained in all the mine workings and, second, that this should be accomplished with the least possible overall cost.

This article covers many of the points to be considered in meeting these conditions. All those interested in mine ventilation will find it a most instructive paper.

IN making air volume measurements underground greater care should be exercised than is customarily the case. The readings are usually obtained by means of an uncalibrated anemometer held by the observer for one minute at the center of the air course. Sometimes in an attempt to improve precision, the operator traverses the entire section during the timed interval by moving the anemometer back and forth and up and down over the plane of the measuring station. However, the observer will usually actually seek out the point at which the anemometer rotates fastest and will use this point as a measure of the average velocity passing the station. It is unlikely that this method will result in measurements which are even approximately accurate.

It is highly desirable to adopt a standard method of air measurement if one is available; one which insures a high degree of accuracy and which requires no more time. I will explain a simple procedure which can be followed easily by anyone familiar with air volume measurements.

Having selected the station for air volume measurement, and having accurately established the true section area at the station, the instrument operator should stand in the center of the air course at a distance slightly less than arms length down stream from the measuring plane. The anemometer should be attached to the end of a stick or rod, of sufficient length to permit the observer to reach both ribs without moving his body location. The stick or rod can be made up in short sections so that it is easily transportable. During the traverse the instruments should be held in each of twelve positions for a period of five seconds per position. These twelve correspond to the centers of twelve rectangles obtained by stretching two strings horizontally across the air course spaced equally between top and bottom, and three strings stretched vertically from top to bottom spaced equally between the ribs. With a little practice one can judge the approximate location for each position with sufficient accuracy by eye.

Beginning the traverse the operator should stand where he can reach the anemometer with his hand and start it. Immediately he should then take his position in the center of the air course down stream from the measuring plane and permit the instrument to operate in the center of each rectangle for the allotted five seconds as timed by a stop watch. The instrument should run continuously, and, as the conclusion of the traverse approaches the operator should walk sufficiently close to the instrument to reach over and turn it off at the prescribed time. In this way the influence of the observer's body upon the air flow past

* Summary of a talk delivered before the Monongahela Coal Mining Institute, September 9, at Morgantown, W. Va.

the measuring station remains unchanged through practically the entire time of measurement and a fairly accurate average velocity is thus obtained. It is important that the instrument correction be applied as indicated by the calibration chart which accompanies it.

When measuring air volume at a section obstructed by roof props located away from the rib, the question is often raised as to the advisability of deducting for the projected area of the obstructions. A simple rule to follow is that no deduction should be made unless the width of the obstruction is equal to, or greater than the horizontal distance between anemometer positions.

Underground Pressure Surveys are Frequently Desirable

It is frequently desirable to indicate on the mine map the actual absolute pressure existing at various points along both intake and return, especially along the free split. The altimeter is the instrument which finds most popular usage in this connection; its application has frequently been discussed. Most observers agree that accurate altimeter surveys should be conducted upon idle mine days, by means of two altimeters. One instrument records barometric fluctuations during the traverse and should be located on the surface. The second instrument is used for determining the pressure gradient throughout the circuit, and should be corrected for elevation, temperature and time.

In my opinion a third altimeter should be employed to insure accurate results. There is always the possibility of an unheralded roof fall on the air course at a point upstream from and close to the point of pressure measurement with a single altimeter, which would have the effect of lowering the absolute pressure at all points on the air circuit downstream from the fall. The presence of the fall might not immediately be detected by volume reduction since the volume changes through the circuit as a result of leakages at stoppings. Therefore, the pressure difference between two points within the circuit might be incorrectly measured as a result of a fall on the air course which occurs between the time of the measurements. The third altimeter would be read at the second point simultaneously with measurement at the first point, thus directly measuring the pressure difference between the two points.

When measuring the pressure difference between two points within a few hundred feet of each other, this measurement can be made with a greater accuracy by means of an inclined manometer equipped with 100 ft. of rubber tubing attached to each side of the instrument. Thus the instantaneous pressure differential between points 200 ft. apart can be directly read without the necessity of correcting for temperature, elevation or time.

Underground Velocity Survey Locate Areas for Correction

The approximate maximum air velocities, allowable at any one mine, depends upon various local conditions such as power value, roof conditions, air volume requirements, etc. Therefore, at any particular mine the air courses can easily be policed with a velometer, an instrument that indicates air velocity instantaneously. By means of this instrument regions of unusually high air velocity can be quickly determined and by means of the inclined manometer equipped with rubber tubing the seriousness of the excessively high velocities can be evaluated. An underground velocity survey with the velometer is therefore a quick and fairly reliable means of ferreting out trouble, which should be generally employed.

How Many Airways Should be Planned

When planning new development the question arises as to the most economical number of intakes and returns to be driven. An insufficient number of air courses is costly because of excessive power requirements for ventilation. On the other hand, an excessive number of air courses becomes costly due to the difference in profit derived from development coal on the one hand and room coal on the other. The formula for the most economical number of air courses is given as follows:

$$N = 9.25 \sqrt[3]{\frac{KQ^3\ OC}{EA^4\ wta}}$$

In which K is the friction coefficient suitable to the local conditions (such as 150×10^{-10}); Q is the total volume of air handled by all entries (CFM); O is the perimeter of each air course (feet); C is the cost of electrical energy (cents per k.w.h.); E is overall unit efficiency of ventilating equipment from electricity to air (percent); A is section area per entry (sq. ft.); w is the specific weight of coal (lbs. per cu. ft.); t is the difference in profit per ton of entry coal and room coal (dollars); a is the amortization rate including depreciation and interest on investment (dollars annually per dollar invested).

This formula is obtained by setting up an expression for the cost per foot of entry system in terms of the cost of power annually per foot of entry system, plus the annual cost of carrying charges per foot of entry system. These expressions involve the terms described above. The first derivation of this cost, taken with respect to the number of entries and equated to zero, permits the solution for the optimum number of entries.

Leaky Stoppings Raise Costs

Leaky stoppings increase both the pressure and power requirements to provide a specified amount of air to a particular area. It can be shown theoretically and proven experimentally, that the pressure increase resulting from the presence of leaky stoppings is approximately directly proportional to the total leakage air through the stoppings expressed as a percent of the air volume delivered to the area to be ventilated.

For example, assume that it is desirable to deliver 100,000 cu. ft. of air to the far end of an entry along which the stopping leakage amounts to 25,000 c.f.m. It is obvious, therefore, that a volume of 125,000 c.f.m. must enter the entry. From the above stated relationship, the pressure across the entry will be 25 percent higher than it would be when delivering 100,000 c.f.m. at the far end of the entry without stopping leakage. Since both the pressure across the entry and the volume delivered to the entry are increased 25 percent, it follows that the power for ventilating the section in question will be 56 percent higher than without leakage.

Location of Regulators and Boosters on Splits

The purpose of regulation of a split is two-fold. It is economical to introduce artificial resistance on a split in the form of a regulator, to prevent the passage of excessive ventilation on the split. From the safety standpoint split regulation is desirable in order that the volume through the split may be varied within limits, to control the contamination resulting from varying rates of gas emission. The location of regulators should be such as to maintain the lowest possible pressure differentials across the stoppings located on the split. Consequently, the regulators should be located completely

outby the split on either the intake or the return, depending upon convenience and system of mining. For example, in the case of an exhaust ventilation system in which the haulage road is on intake air, it is usually desirable to locate the split regulators completely outby the split on the return, whereas, in the case of a pressure system the reverse is true. Occasionally this location will be influenced by the fact that the split parallels the main intakes or returns, separated from each other by doors or stoppings, in which case the split regulator should be located to maintain the minimum pressure difference between the inby portion of the split and the main air courses.

It is sometimes desirable to locate a booster fan on one or more splits. Sometimes, instead of placing regulators upon the splits easy to ventilate, variable speed motored booster fans can be located upon the splits hard to ventilate, with equal flexibility with respect to the control of gas contamination. On the other hand it is sometimes desirable to place a booster upon the free split only, especially when the resistance of this split is such that the pressure required for its ventilation greatly exceeds the pressure required to ventilate the next easiest split.

The benefits of split boosters are many, among which are such items as reduced power requirements resulting from imposing the free split pressure upon the free split volume only, instead of upon the total mine air. Also, the booster fan reduces the pressure differential across all stoppings located outby the booster, thereby reducing the stopping leakage and the total volume of air which must be handled by the primary mine fan.

When installing a booster fan on a secondary split two precautions must be rigidly observed. First, the booster fan must be operated so that the pressure immediately outby the booster is greater on the intake air course than on the adjacent return air course; this eliminates the possibility of recirculation. Secondly, when operating a booster fan and lowering the speed of the surface fan, precaution should be taken against robbing outby splits, either by properly adjusting the speed of the surface fan, or by opening regulators on outby splits.

In the simple case of two inside splits formerly ventilated by means of a regulator on the low resistance split, the proper location of the booster fan on the free split is at a point where the pressure between the intake and return on the free split is equal to the pressure drop across the regulator. The surface fan should be operated at a speed sufficient to pass the original volume at a pressure lower than the original pressure by an amount equal to the pressure across the regulator. When thus operating the actual results will be slightly greater than the former volume on both splits because of benefits derived from reduced stopping leakages outby the booster.

Effectiveness of a Field Air Shaft

The location of a field air shaft is generally determined by the requirements of an already developed mine section which is hard to ventilate, or by a proposed development area too remote for ventilation with the existing system. Frequently, the field air shaft is sunk with the idea in mind of permitting it to serve as an additional intake or exhaust opening, depending upon whether the mine has an exhaust or pressure system, respectively. Used in this manner the field air shaft relieves the intake arteries in the case of an exhaust system, or the return arteries in the case of a pressure system. Since the haulage road must of necessity be kept clean and open, it follows that the haulage road is usually equivalent to at least two air courses where maintenance is doubtful. As a result it is quite customary to find that at least 75 percent of the total mine pressure is attributable to the return arteries in the case of an exhaust system, or the intake arteries in the case of a pressure system. A field air shaft used in the manner outlined above fails to accomplish results desired, since it relieves that portion of the circuit which is responsible for but a small part of the resistance.

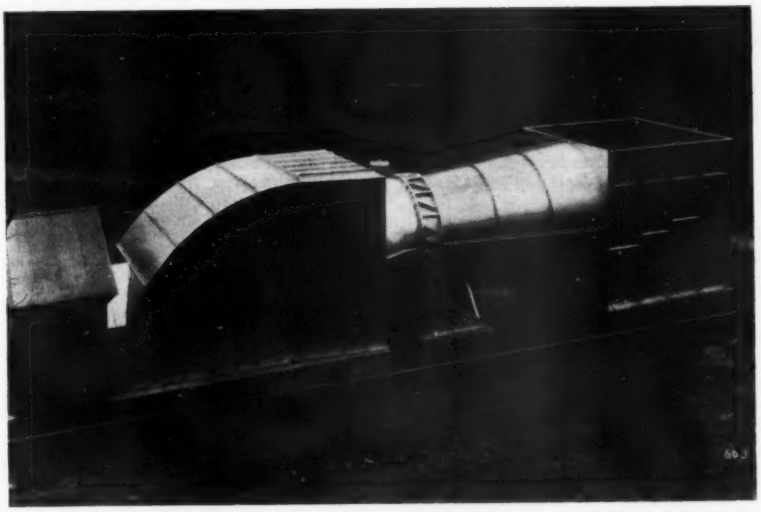
A single compartment field air shaft can be most effectively used when equipped with a fan located at the air shaft. When so used the shaft gives relief where most needed and usually will effect a reduction in total mine pressure of approximately 50 percent when maintaining equivalent mine ventilation.

The most effective type of field air shaft as far as mine pressure reduction is concerned, is a two-compartment shaft which is used for both intake and return. The two-compartment shaft usually relieves both intakes and returns and may reduce the total mine pressure as much as 75 percent or 80 percent when maintaining equivalent mine ventilation. Great care must be exercised in the selection and construction of the type of curtain wall; otherwise the curtain wall is a constant source of leakage waste.

For any particular case there is a definite diameter of the circular air shaft which is most economical considering both power and cost of the air shaft. This optimum shaft diameter is expressed by the formula:

$$D = 1.97 \sqrt[7]{\frac{KQ^3 C}{E\ ac}}$$

In which K is the proper friction coefficient depending upon the type of shaft lining; Q is the air volume to be handled (CFM); C is the value of electrical energy (cents per KWH); E is the overall unit efficiency of the ventilating equipment (percent); a is the amortization rate including depreciation and interest on investment ex-



Another modern mine fan set-up

pressed in dollars annually per dollar invested; c is the shaft cost per cubic yard of finished volume (dollars per cubic yard).

Here again this formula is derived by expressing the total cost per foot of depth as being the sum of the annual power cost per foot of depth plus the annual amortization cost per foot of depth, these costs being expressed in the above described terms. The total annual cost per foot is differentiated with respect to the shaft diameter, and the first derivative is equated to zero, thereby permitting the solution for the shaft diameter that offers greatest economy.

Expansion Air Volume

Where a mine is equipped with a single fan, one can observe, upon stopping the fan, that the direction of the air through the fan reverses itself and ultimately ceases to flow. It will be noted that this condition becomes more pronounced in the case of mines ventilated with high pressures, and also mines from which a large tonnage has been extracted with old workings remaining open.

The reason, of course, for the reversal of air through the fan when stopped, is the resultant contraction or expansion of the air mass within the mine when returning to atmospheric pressure. Assume a mine that maintains a 5 in. water gauge pressure or depression. Assume that the intake or exhaust, as the case may be, is completely sealed and the fan placed in operation at a speed to maintain a 5 in. depression when the air has stopped flowing into or from the mine. The volume of air which the fan must handle in order to create the 5 in. depression throughout the mine can be expressed as numerically equal to one-third of the tons of coal which have previously been extracted. For example, in the case of a mine from which 3,000,000 tons of coal have previously been extracted it is necessary for the fan to handle approximately 1,000,000 cubic feet of air to maintain that gauge with the other end of the mine sealed.

Methods of Splitting the Air

The most effective and economical splitting of underground air circuits is accomplished by splitting the intake as close as possible to the point where the air enters the mine, and reuniting the return air as close as possible to the point where the air leaves the mine. This type of splitting permits air control on the individual splits within the limits of the regulators or boosters without affecting the remaining splits beyond the degree to which the pressure created by the fan is reduced or increased by the change in total fan volume. Consequently, these long splits permit greater power savings with the installation of boosters and the elimination of regulators than are possible when the splits start and terminate far within the mine.

In the case of short splits; that is, such splits as start and end far inside the mine, the individual split air control will influence the ventilation on the remaining splits due to the increased or decreased pressure losses on the intakes and returns outby the splits, occasioned by changes in total mine volume. A system of short splitting is therefore more sensitive to individual split air control than is the system of long splits and, in addition, offers less power savings possibilities when replacing regulators with boosters.

Alabama By-Products Rehabilitates Mine

The Labuce Mine, in the Mary Lee seam, in Jefferson County, Alabama, has been rehabilitated for further production by the Alabama By-Products Corporation, after having been closed down since 1939.

The mine plant has been modernized and prepared for efficient and enlarged output. The washer has been rebuilt and equipment installed in the preparation plant for producing various needed sizes. New mine cars have been provided and mechanical equipment installed for cutting and loading coal.

The Koppers Company will soon complete a new battery of by-product ovens at the Tarrant By-Products plant, giving the company a total of 174 ovens.

Western Brucite Deposit to Be Developed

As plans develop for the greatly expanded production of magnesium metal, deposits of brucite and magnesite in the West become of increasing importance.

A recent announcement was made that the Defense Plant Corporation of the Reconstruction Finance Corporation had approved an allocation of $63,000,000 for the erection of a magnesium production plant near Las Vegas, Nev., and for the development of brucite deposits near Luning, Nev., as well as a salt deposit on the shores of Lake Mead, above Boulder Dam. Title to the plant will be retained by the Defense Plant Corporation, but it will be operated by Basic Magnesium, Inc., of Cleveland, Ohio, which owns one of the immense brucite deposits. It is said that an allocation of approximately 200,000 kilowatts of Boulder Dam power has been made for the new plant; and that in addition a complete townsite will be built, as well as a water-pumping plant and distribution system from Lake Mead.

The brucite deposit is located about 33 miles north of Luning in northwestern Nye County, and it is claimed that 70,000,000 tons of ore have been blocked out. Adjoining these holdings is another deposit which will supply the raw materials from the magnesium plant of the Permanente Company, now nearing completion near Los Altos, Calif.

U. S. Smelting Acquires New Mexico Area

United States Smelting, Refining & Mining Exploration Co. has acquired extensive mining property in the Central mining district of New Mexico, adjacent to the Chino mines of Nevada Consolidated Copper Corp., Ground Hog mines of A. S. and R., and the Black Hawk Consolidated Mines Co. property. Exploration and development have been started.

Old Mine Fire Cut Off

It was recently announced that the underground fire which has burned in the coal fields in the area around New Straitsville, Ohio, since 1884 has at last been brought under effective control.

The fires were started during a mine strike in 1883 and various efforts to extinguish or control them had failed, with the result that an estimated $50,000,000 worth of coal has been burned, and the creeping fire threatened to spread to connected fields containing many additional millions of dollars' worth of coal. In 1936 the WPA under direction and advice of the U. S. Bureau of Mines undertook to isolate the fire by driving tunnels in the areas which the fire was approaching and backfilling with incombustible material.

Three barriers were thus made, known as the Plumer Hill, Lost Run and Shawnee, consisting of both open cut and underground work extending through the coal bed from outcrop to outcrop. The total cost of the undertaking was $809,010; the city of New Straitsville contributed $43,652 and the remainder was paid by the Federal Government. The Plumer Hill barrier was the first completed and is 640 feet long; the other two barriers are approximately one mile long. When the fire reaches these barriers it will be effectively checked and cannot spread to adjacent areas.

Defense Activity of the Reconstruction Finance Corporation

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No more authoritative statement of the purposes of the RFC in regard to mines and minerals can be made than this, by the Chairman of the Board. Mr. Henderson outlines the manifold activities of the Corporation in procuring needed metals and minerals and in encouraging greater production.

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By CHARLES B. HENDERSON
Chairman of the Board of Directors
Reconstruction Finance Corp.

IT has always been the practice of the American Government to recognize the importance of mines and minerals as an integral part of our national economy. It was the lure of metals which sent prospectors into the unknown west of our country to become the vanguard of the thousands who followed to settle and stake claims. Among the first acts of the governments of the new territories was the declaration of laws to protect these property interests. Mining laws followed, and upon them was founded the whole legal structure fixing the rights and privileges in the several mining districts in the states where located.

Federal Government Has Established Agencies to Foster Mining

As new minerals were found and new uses discovered to meet the changing times, the Federal Government did its part to lend aid by establishing agencies whose function it was to encourage and foster progress in the field of mining, minerals and metals. One of these is the Bureau of Mines. Cooperating with the Bureau of Mines and rendering signal service has been the Geological Survey. In addition, the National Bureau of Standards offers metallurgical services; testing facilities and authoritative opinions on metals and problems connected with their uses. These services and studies are evidence of the constantly increasing recognition of the importance of minerals and the products made therefrom.

It is not surprising, therefore, that the Government, in its efforts toward rehabilitation following general financial and economic collapse in 1929, made definite and specific provision for direct aid to the mining industry though the medium of the Reconstruction Finance Corporation. Up to the end of June, 1941, the Corporation authorized loans and investments totaling $14,000,000,000 (not including those for relief and to other governmental agencies), of which approximately $8,750,000,000 has been disbursed and of which approximately $6,500,000,000, nearly 75 percent, repaid. These large aggregate totals have a tendency to obscure the fact that an important part thereof is represented by aid to the mining industry, which aid was extended early in the history of the Corporation.

In 1934 the same law which gave the Corporation authority to make loans to industrial and commercial businesses authorized the making of loans to corporations, individuals and partnerships engaged in the business of mining, milling, and smelting of ores. About six months later the law was broadened in scope to empower the Corporation to lend to those engaged in the development of ore placer deposits containing gold, silver or tin.

Law Relating to Mining Loans Liberalized

In the fall of 1939 the President declared a limited emergency and turned the thoughts of the country to additional ways and means of preparing for national defense. To this end Congress in September, 1940, liberalized the law relating to development mining loans by authorizing such loans in connection with strategic or critical minerals of value to the United States in time of war. Whereas the 1935 law was limited to specific materials, namely, gold, silver and tin, the 1940 enactment has added thereto a general, broad term—strategic and critical minerals. This gave latitude for interpretation and an opportunity to aid the mining industry by including more of its products.

In modern mechanized warfare vast quantities of metal of all kinds are necessary and supplies of minerals must be constant. Lack of capital for investment had not only prevented the opening of new and valuable mineral deposits but had caused many small mines, and some in the middle group, to cease operations with respect to those ores already discovered. The larger companies were producing but there was the ever-present possibility that their mines might become depleted. It was realized that insurance against this contingency made advisable bringing into being many little mines, some of which might become the big mines of the future. It was essential to encourage the finding and development of new domestic deposits. The benefit would be twofold—an aid to national defense and increased employment of labor—not only in the mines but in the industries utilizing, processing and fabricating the materials produced. Stockpiles of strategic

minerals and metals, obtainable mainly from abroad, had to be accumulated and reserves of critical materials had to be built up until such time as our own domestic sources were tapped and ready to produce. We cannot depend on foreign ores and leave domestic ores in the ground until they are needed, for they are not true reserves until they are in production, and this takes time and preparation.

Stockpiles of Strategic Minerals Acquired

In furtherance of this program and pursuant to a provision of the Strategic War Materials Act the Procurement Division of the Treasury Department had since 1939 been acquiring stocks of some strategic materials. The value of this activity was not too evident, however, due to certain inherent difficulties in the procedure, and consequently few deliveries were made. Something had to be done to rectify this condition if the defense program was to go forward. As world conditions grew steadily more ominous additional measures became necessary. The RFC was selected to give effect to such measures through authority similar to that granted the War Finance Corporation in 1917. Thus, on June 25, 1940, Congress authorized the Reconstruction Finance Corporation, among other things, to create or to organize (when requested by the Federal Loan Administrator with the approval of the President) a corporation or corporations with power to produce, acquire and carry strategic and critical materials as defined by the President. The RFC was also empowered to make loans to or purchase the capital stock of the corporations so formed.

Pursuant to this enabling act four corporate bodies were created to aid the national defense program—Metals Reserve Company and Rubber Reserve Company were created on June 28—only three days after the enabling act, Metals Reserve with a declared purpose to acquire and carry a reserve supply of critical and strategic materials and Rubber Reserve to acquire and carry a reserve supply of crude rubber. About two months later, August 22 and August 29, respectively, Defense Plant Corporation had authority with respect to strategic and critical materials covering all phases from buying to marketing together with all the plants and land, equipment, etc., in connection therewith. It can use this broad authority specifically for the manufacture of arms, ammunition, and implements of war either by leasing or licensing the facilities or engaging directly in such manufacture if the President finds it necessary. Defense Supplies Corporation has all necessary authority to deal in strategic and critical materials, can produce, lease, purchase or otherwise acquire railroad equipment and commercial aircraft and lease, sell, or dispose of same, including facilities for the training of aviators and to take such further action as the President and Federal Loan Administrator deem necessary.

Each of these four entities is capitalized at $5,000,000, managed by a board of directors appointed by the RFC and with officers and agents appointed by the board. Each is performing its intended function with as much speed and dispatch as is consonant with efficiency and proper correlation of the whole defense effort. Of special interest to you is the Metal Reserve Company, which deals with the acquisition and carrying of strategic and critical metals and minerals.

Functions of the Metals Reserve Company

The function of the Metals Reserve Company is in effect that of a purchasing agency charged with the duty of acquiring and carrying strategic and critical materials in a manner which will not interfere with industrial requirements or dislocate the market generally. Commitments are made for the purchase of raw materials from domestic and foreign sources of supply and for stockpiling them in this country. At first the Government was concerned primarily in stockpiling supplies, but now it is concerned with getting needed supplies and stockpiling any excess.

Materials for stockpiling and for sale by Metals Reserve Company are acquired pursuant to recommendations of the Office of Production Management.

Arrangements for such purchases and sales are made to meet the demands of each particular situation. In case of purchases, the material is accepted by Metals Reserve, placed in stockpile, there to be available for industry or the Government as indicated by OPM.

At the outset the chief activity of Metals Reserve Company was acquiring strategic and critical materials for stockpiles, but demands of defense during the past four months have been such that sales of such materials have become a more important activity. In sales the procedure is informal. Metals Reserve Company sells from its stockpiles upon authorization from OPM. Thus, if a manufacturer needs materials, Metals Reserve Company requests a recommendation from OPM setting out fully the type of material needed, the use to be made thereof in the defense program and evidence of inability to obtain supplies through normal trade channels. After appropriate investigation, if OPM is satisfied that the request is merited, it recommends that Metals Reserve Company sell the specified quantity of stockpiled raw materials to the applicant manufacturer.

All in all there is no doubt but that the operations of Metals Reserve have assisted materially in averting acute shortages of materials and have precluded what would have been serious delays in our program of national defense. How important has been the work of Metals Reserve Company is evidenced by the fact that the RFC has made commitments to the Metals Reserve Company of an aggregate amount of $1,000,000,000 for the purchase of the strategic and critical minerals and metals used in the defense program.

These critical and strategic materials are not only necessary in national defense, but are also used widely in civil non-defense manufacture.

Diversion of Materials from Non-Defense Uses Not Enough

The most obvious means to acquire reserves of material for defense purposes would appear to be diversion to the stockpile of many materials used in non-defense production. Diversion alone, however, is not sufficient to meet such demands because of other factors involved. Only a certain amount of non-defense curtailing is possible, and this must be slowly and cautiously done so as not to affect the labor market and other conditions. Every non-defense factory closed by shortage of material means many unemployed and a consequent labor maladjustment until such time as the new defense businesses begin operations and take up the slack. It is in recognition of this principle and the fact that the trades are working in defense projects that Metals Reserve Company at the outset acquired only those materials not needed by the trade.

Domestic Sources of Supply Encouraged

Another way to fill our needs is to increase the supply of materials domestically which will also free this country from dependence on sources which

The RFC Building, Washington, D. C.

might be cut off by a war. Private sources have not been ready to loan substantial sums to producers against contracts for output, and, to meet this need, Congress authorized development loans to mines even though their effect could not be immediate. As a further aid to domestic and hemispheric productions, Metals Reserve has entered into contracts for over 3,000,000 tons of manganese ore, leased two chrome properties and is constructing a concentration mill, encouraged the production of domestic tungsten by purchasing from new operators in Nevada, Utah and California, and similarly acquired antimony from Texas. In short, help is being extended to operators in almost every state in the Union wherein commercial mineral deposits are found. This program has taken on an international aspect with contracts in Canada for aluminum, nickel, lead, and zinc as well as a variety of materials from Cuba and South America. Nor has the important complementary field of research and equipment been neglected. The company has underwritten field and laboratory experimentation with manganese and with tin.

To accomplish these results, RFC had to eliminate the objections to and limitations upon the buying activities of the Procurement Division of the Treasury Department. Metals Reserve is not subject to the regulations which govern Treasury purchases and has authority to purchase supplies on any terms it deems advisable. Negotiative sales and informal procedure have replaced formal bids. Metals Reserve can fix its own terms with respect to the creation of any particular reserve which it seeks to acquire. Stockpile sites for certain materials have been established at Baltimore, Pittsburgh, Birmingham, New York, Tacoma, and other points in the West.

Other Steps Have Been Taken

But as old problems are solved new ones arise. At the present time it is necessary to meet the immediate needs of the rapidly expanding defense activity. The steps being taken are proving satisfactory for the acquisition of strategic materials, found principally in other parts of the world, and equally necessary for defense.

The chief of these, tin and manganese, were the first materials Metals Reserve was authorized to acquire. Obviously the wisest move was to seek the best and largest supply of ore obtainable. To help assure a sufficient supply of tin a conference was arranged with the International Tin Committee, a group representing nine sovereign powers which virtually control the production of all the presently available tin in the world. As a result of this conference an agreement was entered into whereby the quota of pig tin was increased from 80 percent to 130 percent—the equivalent of unlimited production. This makes available to the United States approximately 75,000 tons over and above the 80,000 to 85,000 tons normally required. It is from this surplus that Metals Reserve has been able to acquire stockpiles of pig tin.

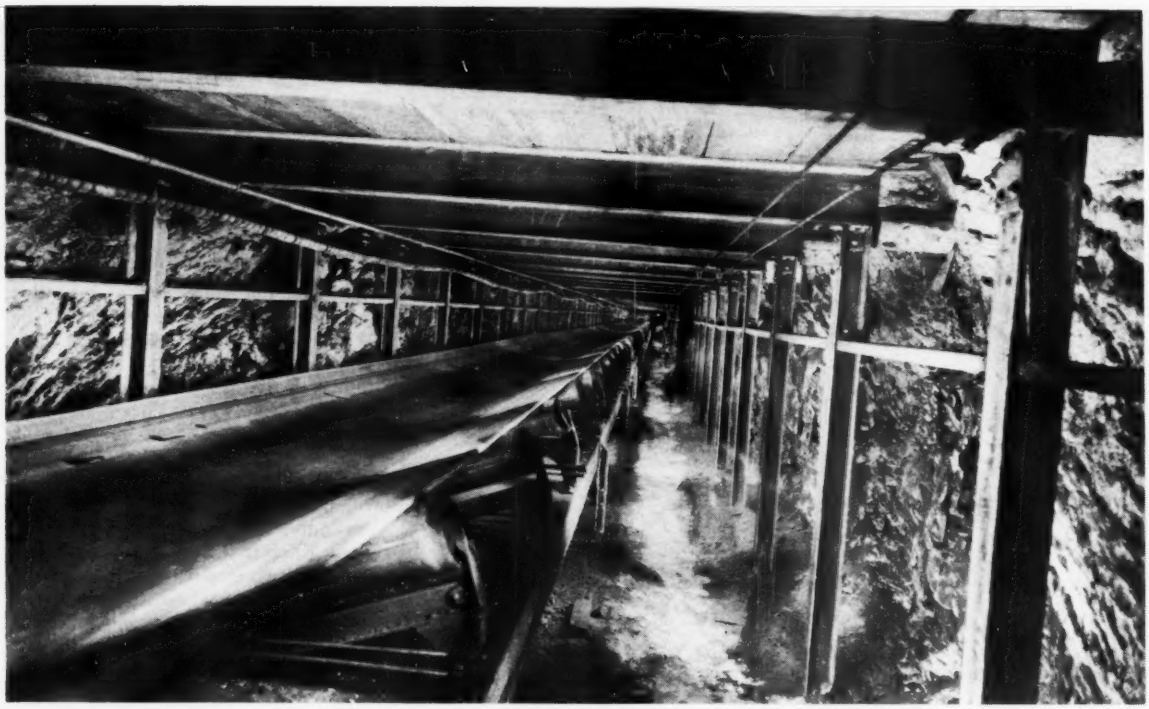
The agreement covered not only the production of the highest grade tin ore, but the other kinds as well. To insure adequate future supply it was decided to develop lower grade ores nearer to the United States in the event that the more desirable source be cut off. Bolivia, the chief source of tin in the Western Hemisphere, had been shipping to the Continent of Europe and much of its tin had been reaching Germany. However, since Metals Reserve agreed to buy 90,000 tons of Bolivian pig tin at the rate of 18,000 tons per year over a period of five years, Bolivia has, in turn, agreed to sell only to the United States and Great Britain. The importance of this transaction is more than in the amount involved. Tin is the basis of Bolivian economy and the stabilizing influence of this agreement will go far toward strengthening a feeling of good neighborliness in that country.

Agreements Being Made with Latin American Countries

In addition to the Bolivian contract, Metals Reserve is making similar agreements with other Latin American countries. The Federal Loan Administrator, Honorable Jesse Jones, has arranged for this country to purchase the entire output of the South American continent, in certain commodities. The list includes diamonds, quartz crystals, copper, lead, zinc, tin, antimony, tungsten, manganese, platinum, zirconium and rutile. Supplies of those materials in excess of industrial demands will be stockpiled. An export embargo against the shipping of these products to other than United States or other countries of the Western Hemisphere has been agreed upon. The effect of this program is threefold —it gives us the materials, it cuts off supplies which might reach unfriendly nations and it promotes the extension of goodwill and sound national economy for the countries to the south.

The effect does not end with the purchase, for the acquisition of these materials gives rise to much complementary activity. As an example, the acquisition of Bolivian ore made necessary a smelter to process it. Accordingly, Reconstruction Finance Corporation furnished the money to build such a facility at Texas City, Texas, where is found the necessary gas sup-

(*Continued on page* 43)



Belt gallery and 48-inch conveyor belt, D. O. Clark mine of Union Pacific Coal Company

Training Personnel in the Problems Of Mechanical Mining*

By R. R. KNILL
Safety Engineer
The Union Pacific Coal Company

There can be no question but that careful and systematic training of personnel in mining and safety methods is the best means of reducing accidents and promoting efficiency. Mr. Knill here describes the very successful system employed by the Union Pacific Coal Company.

That the company's system has been successful over the years is attested to by the fact that the company mines have a most enviable safety record. Recently the company was awarded the Sentinels of Safety trophy for the sixth time, the award going to the Rock Springs No. 4 mine.

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THE mechanization of coal mining brought with it many problems. Some of the problems confronting the industry are new; however, most of them are old and probably have become more acute.

The cutting machine has been with us many years; it was a permanent fixture during hand-loading days and properly belongs to that era. The same is true of the haulage locomotive. The problems of roof support and haulage have always given us a great deal of concern. These two factors have been, and still are, our greatest sources of accidents in coal mines.

Mechanization Has Brought New Problems

The mechanization period, as we consider it, starts with the addition of mechanical loading equipment. The handling and the operation of this equipment, together with the greater use of electricity, present problems which are definitely new. We could probably go on indefinitely enumerating the problems of bituminous coal mining, the seriousness of which depends, to some extent, upon the physical conditions found in the various fields. However, most of these problems would be confined to the development of a mining system adaptable to mechanical loading, and to the training

*Presented at National Safety Council Convention, Chicago, October 9.

of men, both from a supervisory and operative standpoint.

The background for this paper is based mainly upon the experiences of The Union Pacific Coal Company, which, as is the case with many other companies, has gone through the transition period from hand loading to completely mechanized mining. With the thought in mind that some companies are not yet completely mechanized, it will probably, not be amiss to give some idea of our mining conditions.

Mining Conditions at Company Properties

Our mines are all in pitching seams varying from 3 to 17 degrees; and the thickness of the seams mined varies from 5 to 32 ft. Until recently our thickest seam has had the greatest pitch. All seams outcrop so that our cover starts at zero and varies to approximately 2,500 ft. The top is generally considered good until we reach a point that we call water level, after which it needs more attention. Part of this, of course, is caused by increased cover.

Normally we mine about 3,250,000 tons of coal annually, all of which is used in fueling the Union Pacific Railroad. While mechanical loading was still in its infancy, this company foresaw the threat of competitive fuel; and, following the lead of the railroad we supply, we realized the need of greater safety in our mines. These two factors, together with the necessity of getting a better recovery of coal, created a need for better mining, and mechanical loading was looked to for the answer.

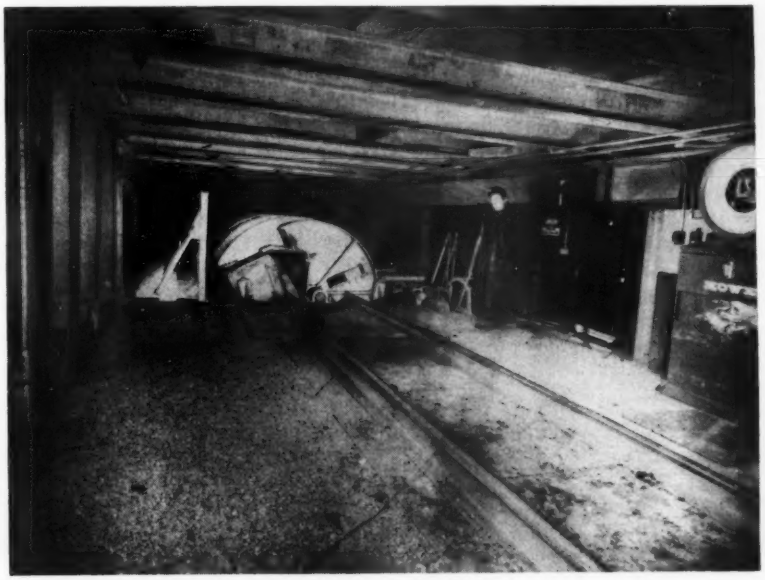
A Ten-Year Plan Was Set Up for Mechanization

A far-reaching plan was set up whereby the change-over was to require 10 years. During this time enough equipment was to be added so that our mechanically loaded coal would increase about 10 percent annually. Actually this was accomplished in about eight years. This plan had many things in its favor. It allowed time to experiment with various types of loading equipment, and time to try several systems of mining. We have found for our conditions that the room and pillar system—driving entries to an established boundary and working on the retreat—is the best. This plan has also allowed us time to train many supervisors and operating crews, by shifting and moving men until we have found combinations which work well together.

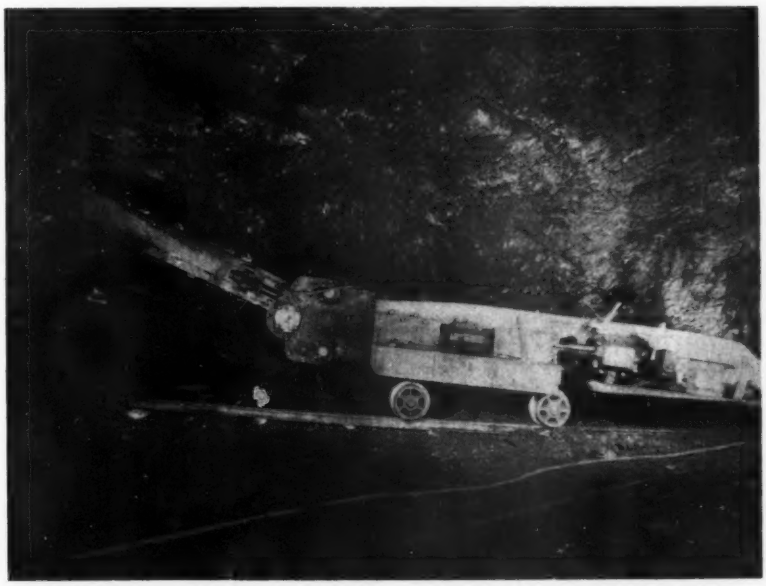
Heretofore, our supervision had been carried on in about the same manner as during the hand-loading days, with a foreman and one or two assistants comprising the entire supervisory force in one mine. Under the present system we have one foreman and several unit foremen, depending upon the number of units working. Generally we have one unit foreman for two units; however, the territory is sometimes extended if there is a third unit that may be included to good advantage. This increase in the number of unit foremen has made it necessary to train additional personnel in a supervisory capacity. In choosing unit foremen, it is the policy of the company as far as possible to select men who have demonstrated their ability as leaders in the crew.

Policy in Training Personnel

In order to give a definite picture of the entire process of training our personnel, it would be well to start at the time a man is hired.



Dump station, showing dump in partially rotated position. Mine of Union Pacific Coal Co.



C. L. U. shearing and cutting machine in an entry of No. 4 mine, Hanna, Wyoming

Our general policy of hiring labor has been to employ sons of our present or former employes, preferably those having a high school education. This practice has two distinct advantages; first, these young men who come from local coal mining families are more apt to become permanent employes, thus cutting down our labor turnover; second, these men have no tradition of hand loading to break down and respond more readily to training in mechanical loading.

Prospective Employes Examined Carefully

All employes are hired by the general superintendent (except in our one outlying district where distance makes it impracticable) who personally interviews all applicants, ascertains their background, and their probable permanency of employment. This last factor mentioned is considered important, as the training of an employe takes time and costs money.

The applicant is sent to the doctor for a physical examination, and to the oculist for eye examination. Men who are physically fit are sent to the superintendent of one of the mining districts who outlines the policy of the company, especially in regard to safety. The superintendent informs the man that it is the requirement of employment that he wear hard hat, hard-toed shoes, and safety goggles while on duty. Also that he will be required to take and pass the first-aid course as prescribed by the United States Bureau of Mines; and that he is expected to attend all safety meetings in his district.

The superintendent then gives him a book of rules for which he is required to sign; and advises him to familiarize himself with these rules and abide by them. The man is then assigned to a mine and sent to the mine foreman.

The mine foreman reiterates the advice of the superintendent, especially with regard to safety. There are several different ways in which a new man may be started to work. First, if he is to be put with a shaking conveyor crew, it is advisable to put him with a crew leader who has demonstrated his ability to train men. The leader of this crew or the unit foreman of the section personally sees that he arrives safely at the working place. He is put in, for a few days, as an extra member of the crew, and part of his time is taken up with helping with the various operations of the crew. The lead man and the unit foreman both observe this man closely, in order to learn his adaptability to certain types of work. After this period as an extra member of the crew, he is usually assigned as a faceman or a loading head man. As a faceman, he has the opportunity of learning the various operations of the crew.

The next step in his training is that of a ratchet man or duckbill operator. Usually as a faceman he has learned to operate the duckbill and is proficient in its use before he is assigned as an operator. His next step is that of cutting-machine operator. In this position he is recognized as the leader of the crew, and is in charge of operations in the absence of the unit foreman.

In the case the man reporting to the mine foreman is an experienced cutting-machine operator, he sometimes is placed in the crew as such if there is an immediate need for one. However, it is our general policy to consider an experienced man the same as an inexperienced one, in so far as he is started as a faceman, although his progress in becoming a machine runner is more rapid.

As most of the accidents occur at the working face, it is of utmost importance that the man be thoroughly trained. All of our shaker conveyor room work is timbered with systematic timbering in order to eliminate accidents from falls of roof. The top in a great many of the rooms appears good. For this reason a new man will fail to see the necessity of timbering the place as closely as is required by our systematic plan of timbering. Therefore, it is necessary to impress upon him the necessity of setting timber just as soon as there is room for it.

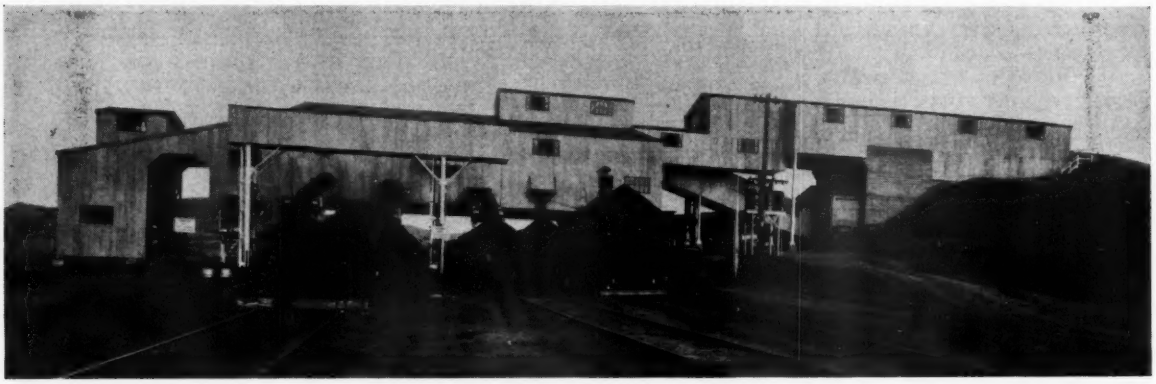
Training in High Coal Areas

In our high coal district where we are mining 32 ft. of coal with mobile loaders, it is the practice to employ a group of five or six men. These men are sent into the mine under the personal supervision of a unit foreman, and will usually be assigned to clean-up work in the rooms. This has the advantage of allowing a new man to satisfy his curiosity, to familiarize himself with the working places, and to see how the machines are operated. After a few days of this work he might be assigned to various other casual labor.

In the case of crews on mobile loaders, very seldom, if ever, is a new man assigned to one of these crews. Usually a man who has been in the mine three or four months is taken and assigned as a "nipper" on the haulage crew of the unit. From there he goes to motorman, thence to the helper on the loading crew, and then to the operator. This means that when a man becomes the operator of a mobile type loader he is proficient in both the haulage and the loading.

Men who are not assigned to loading crews are put on helping timber-

(*Continued on page* 43)



Tipple of Union Pacific Coal Co. at Reliance, Wyoming

Aluminum From WESTERN ALUNITES

By FRANK EICHELBERGER
President
Kalunite, Inc.

The supply of bauxite ore for the production of aluminum is limited. The development of the Kalunite process, described here, renders available additional sources in alunite, as well as practically inexhaustible potential resources in clays. At this time, when a plentiful supply of aluminum is vitally needed, the development of the Kalunite process is particularly important, and this description by Mr. Eichelberger is most timely.

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THE defense needs for aluminum have presented problems of such magnitude that they have become the concern of the Government. The Office of Production Management, realizing the great needs for aluminum in the production of airplanes and for other important defense uses of the metal, have provided for this need by building Government-owned plants.

Before aluminum can be produced by these plants it is necessary to provide a source of aluminum oxide from which aluminum is produced.

History of Aluminum Production Processes

Aluminum is the third most abundant element of the earth's crust, being exceeded in abundance only by oxygen and silicon, which two comprise about 75 percent of the crust. Aluminum is, therefore, not only the most abundantly occurring light metal but is also at the top of the list of all the metals which are in common use as metals.

During the early development period, 1886 to about 1900, when the metal aluminum attained its promise as one of the common useful metals, the sources of alumina were also undergoing intensive study and development. With the establishment of the Hall-Heroult process as a successful commercial process, the future for the metal in industry and commerce seemed assured. The rapid development of electric power facilities, particularly on the basis of water power, left only the matter of the ore of aluminum and the process for the production of alumina as decisive points for the continued expansion of the production of this metal.

While the basis of the inspiration for the two inventors had undoubtedly been the known properties of the metal, especially lightness, as proven by Deville's work, it may be noted that Hall, the American inventor, was definitely inspired by the suggestion that aluminum was the base metal of common clay, while Heroult must have had in mind the extensive resources of bauxite in France where it was first discovered in the vicinity of Les Beaux.

The invention of the Bayer process during this same period of development and the discovery of numerous bauxite deposits in various localities focused attention on this combination. The process was admirably suited to the treatment to produce alumina. The superiority of this process, an alkaline circuit type, was due to the facile elimination of iron, which was often present in considerable quantities, especially in the French ores, and to the elimination of corrosion resistant equipment, which during the early period was exceedingly expensive and non-existent in many cases. These two conditions could not be met with any type of acid process.

Control of the Industry Has Tended to be Monopolistic

As the industry developed, and its principal growth has been since the expiration of the patent rights, it grew as a monopoly, principally through the acquired control of all bauxite deposits suitable for the production of alumina of metal grade. This led to a consideration of other possible ores because those who were interested in entering the business of producing metal on a sound competitive basis found that any available uncontrolled bauxite was too limited in quantity or was of too high cost on which to base a sound competitive company.

Conditions for Successful Production

To attain success, the combination of ore and process must qualify in meeting the following conditions which have already been noted in this discussion, and are namely, (1) to produce alumina of satisfactory quality so that the metal produced in the electrolytic cells will meet specifications, (2) the process must be technically feasible on a large scale, and (3) the cost of producing alumina must be competitive, which for the United States means a cost of $35 to $40 per net ton, including proper amortization and depreciation charges. The obvious restriction regarding suitable ore reserves need not be specially considered due to the known abundance of the aluminum silicate ores. For example, the clay deposits can be considered as inexhaustible.

The absence of a competitive industry to date has been in the failure to meet successfully the large scale technological restrictions. In each of the suggested processes some detail appeared which on expansion from laboratory scale with its attendant neglect of mechanical handling, heat transfer, etc., to pilot plant scale wrecked the possibilities of fulfilment of the project.

Kalunite Process Meets These Conditions

This condition was as true in the United States until the advent of the Kalunite process. This process was developed for the treatment of the alunite ores. Alunite is a hydrated basic potassium aluminum sulfate, which for simplicity may be considered as a combination of anhydrous potassium alum and alumina hydrate. It occurs in large amounts, particularly in the Marysville, Utah, district. The grade varies from 15 to 20 percent alumina up to 35 percent alumina, with silica, iron oxide, titania, and other impurities, of which silica occurs in the largest amounts.

In the consideration of this ore, it is to be noted that it contains potassium sulfate and sulfuric acid, which represent valuable byproducts and belie the tentative low grade of the ore, as well as to represent reagents for the treatment of the ore. In the previous efforts to treat this ore, the intermediate potassium alum was isolated but efforts to convert this compound to pure alumina failed.

It is at this point that the Kalunite process conquered the problem and provided the technology on which to base an industry utilizing low grade ores, such as alunite and clay. The conversion of potassium alum to a basic compound by the autoclaving procedure, the step introduced by Kalunite process, is as important and fundamental as was Bayer's invention for the utilization of bauxite ores.

The Kalunite process has been developed for alunite ores, having been carried out on a pilot plant scale, sufficiently extensive to confirm the technological aspects and to insure the success of a commercial plant with a definite promise of a competitive combination against the presently constituted industry.

It is also fundamental that any ore which can be converted to potassium alum can be treated by the Kalunite process. The competition between various ores will be based on the economics of the commercial factors, location, transportation, power, labor, fuel, and markets.

With the final proof of the Kalunite process on a commercial scale, it may be said that the future development of aluminum will only be a function of world conditions, for the final barrier, the limitations of ore, have been removed. The future ore of aluminum will be the vast clay deposits of the world.

Constitution and Sources of Alunite

Alunite, alum stone, was recognized as a source of alum by the Romans several hundred years before the Christian era, so it is not a newly discovered mineral. Until potash alum was made synthetically, about 100 years ago, alunite was the only source of this valuable chemical for centuries, and potash alum is still manufactured from alunite in Europe and is called Roman alum by English cloth dyers.

Alunite occurs widely scattered throughout the entire world, but it is most generally found in arid or semi-arid regions, although there are many exceptions to this. To mention two, the deposits near Mt. Rainier and those on Vancouver Island.

In World War I alunite was mined rather extensively and treated for its potassium sulfate contents, as the price of this chemical was between $400 and $500 per ton and large profits could be made.

Alunite chemically is a hydrous basic potassium aluminum sulfate with the formula $K_2SO_4 . 3\ Al_2O_3 . 6H_2O$. Physically when pure it is a light pink mineral with a hardness of about 3 and a gravity of 2.65 to 2.72. Individual crystals are too small to be seen megascopically so that it is difficult to recognize when it is low grade.

The Kalunite process for the treatment of alunite for the production of alumina, potassium sulfate, and sulfuric acid is a dilute sulfuric acid process. It is not only adapted to the treatment alunite, but also to high aluminous clays and high silica bauxites.

Kalunite Process, Treating Alunite, Has Four Steps

In this paper only the treatment of alunite will be considered as most of our work has been with alunite. The process can be separated into four steps:

1. The manufacture of potash alum;
2. The autoclaving of the potash alum solution to form a hydrous basic potassium aluminum sulfate, analogous to alunite.
3. The calcination of this product to drive off the sulfur oxides from the alumina; and
4. The leaching of the solubles K_2SO_4 from the insoluble alumina.

The manufacture of potash alum from alunite presented no new problems to us and our efforts were confined to the materials of construction, high extractions, and purity of the alum produced.

The alunite, after grinding to minus 16 or 20 mesh, is dehydrated in a multiple hearth furnace. This type of furnace was chosen for better heat transfer, small dust losses, and close temperature control. Alunite gives up its water of combination slightly under 600° C. When this temperature is not exceeded, no loss of SO_3 occurs, and theoretically all of the alunite can be converted to normal potash alum if there is sufficient sulfuric acid, potassium sulfate and water present.

The reaction is carried on in a counter current leaching circuit with cyclic sulfuric acid and potassium sulfate solution derived from the autoclaving step. As this leaching operation is continuous the pulp from the first agitator contains an excess of calcined alunite (metalunite) so that no free sulfuric acid is present and the solution is slightly basic, with some dissolved free alumina present. The silica, titania and most of the iron present in alunite ores as impurities are not soluble in the dilute sulfuric acid solution, but what iron does go into solution is precipitated in the first agitator, where there is an excess of the calcine.

The pulp from the first agitator is run to a thickener and the overflow solution containing a small amount of mud is either filtered or is cooled and the alum allowed to crystallize in the presence of the mud. By regulating the cooling rate and agitation in the crystallizing tanks, no inclusions of mud are found in the crystals. The crystals are then filtered on a coarse screen, which allows the muddy solution to run through the cloth. The crystals are washed with cold water on the filter to remove any adhering mud and solution.

The process at this point has converted the alumina potassium content of the alunite to potassium alum crystals. The function of these steps is to effect the purification of the alumina. This has been controlled at two points:

1. By adjusting the leaching circuit to yield a solution containing dissolved free alumina, the dissolved iron is precipitated.
2. The crystallization of potash alum eliminates all deleterious soluble impurities.

Having made a pure product, the subsequent steps are for separating the constituents from each other and their recovery in the desired form.

Treatment of Alum Crystals

When the washed alum crystals come off the filter they are melted or dissolved in dilute potassium sulfate liquor which is obtained from the last step in the process. A very strong alum solution is made and this solution is pumped through a continuous autoclave. This autoclaving step constitutes the new and revolutionary step introduced by the chemists and engineers of Kalunite.

The autoclave is simple in construction, has no moving parts, and permits of salvaging the excess steam for use in the leaching and dissolving steps. The strong alum solution is pumped through the autoclave at 250 lbs. per sq. in. and steam is introduced at a temperature of about 200° C.

Basic potassium aluminum sulfate is formed with the liberation of sulfuric acid, potassium sulfate and water. The basic alum formed is insoluble in water or dilute sulfuric acid and settles rapidly in a thickener. The hot clear potassium sulfate—sulfuric acid solution overflow from the thickener—is returned to the leaching circuit. The autoclave reaction is the source of the potassium sulfate—sulfuric acid cyclic solution.

The autoclaving step accomplishes the dehydration of the normal alum and reduces its bulk by the elimination of two-thirds the potassium sulfate, five-ninths of the sulfuric acid, and seven-eighths of the water originally present in the alum molecule.

The basic alum is pumped from the thickener, filtered and fed to the top hearth of a 10-hearth furnace. The top four hearths are open hearths, the lower six are muffled; utilizing waste heat from the muffles the upper two hearths are used as dryers and in the next two hearths the water of combination is driven off. In the six muffled hearths the heat is gradually raised to approximately 1000° C.

Above 600° C. sulfur trioxide begins to evolve from the aluminum sulfate. The evolution of sulfur trioxide from the aluminum sulfate is completed on the tenth hearth. Potassium sulfate does not fuse at temperatures reached in the furnace and the end product is a mechanical mixture of alumina and potassium sulfate.

As there is a great excess of sulfur trioxide in alunite, over the amount used in the process, only the SO_3 is recovered and the SO_2 is allowed to waste into the air or, if there is a market for sulfuric acid, the SO_2 can be recovered as acid.

The hot calcine from the furnace is introduced into a counter current leaching circuit where the potassium sulfate is leached out with water. The solution is filtered and the alumina filter cake dried and is then ready for reduction to metal. The K_2SO_4 is recovered by crystallization from solution.

As nearly all alunites contain Na_2O and some are practically soda alunites (natroalunites) some soda alum is found. Soda alum is extremely soluble at ordinary temperatures but in cold solutions containing 50 to 60 percent potash alum some soda alum crystallizes and the soda finally shows up as sodium sulfate in the potassium sulfate. In the years we were experimenting and making alumina, we did not find soda building up appreciably in our circuits.

As the hot calcine is dumped into the potash alumina leaching circuit a great deal of water is boiled off and it is in this step that most of the make-up water is added as wash water for washing out the potash from the alumina. If any solutions in the leaching circuit are dumped, the solutions are ponded and at intervals the potassium alum crystals can be harvested and returned to the leaching circuit.

Alumina is Then Used to Produce Aluminum

Aluminum is produced by the Hall-Heroult process which involves the electrolytic reduction of alumina in a bath of molten cryolite. This is standard practice and is used by all producers of aluminum metal.

One of the principal requirements is that the alumina be of a chemically pure grade since any impurities which may be present in the alumina will accumulate in the metal. Alumina differs from other metals, such as iron, copper, lead, and zinc, in that subsequent refining processes of crude metal reduced from natural ores is expensive and would put metal, produced by multi-stage processes, including refining, out of competitive range.

The alumina produced by the Kalunite process is comparable chemically with that produced by the Bayer Process, except that K_2O is present instead of Na_2O, and much less titania. Metal made from alumina produced from alunite by the Kalunite process compares competitively with metal produced by Alcoa.

Our resources of bauxite will be seriously depleted if this defense program should run for four or five years. Remember that bauxite is needed for many other uses besides the production of metal and the supply is limited. The supply in the United States of alunite is unknown; but the quantity is relatively small if the United States had to depend upon this mineral for its aluminum. High aluminous clays exist in unlimited quantities. Specifically, one high alumina clay deposit in the State of Washington has been estimated to contain over 250,000,000 tons. This deposit alone could supply the present and contemplated aluminum plants using Columbia River power for over 100 years.

Commercial production of aluminum from alunite will begin in 1942 with an estimated daily capacity of 50 tons of aluminum ingots. What the future holds forth for this process in the production of alumina is purely one of competitive costs.

Montana Dredge Starts Operation

Following christening ceremonies and celebration, the Emigrant Dredging Company recently placed in operation at Emigrant Gulch, Mont., one of the three largest gold dredges in the United States. The dredge will handle 7,000 to 8,000 cubic yards per day; it is equipped to dig to 80 ft. below water level and to 30 ft. above. The bucket boom is 168 ft. long and carries a chain of 110 buckets, each with a capacity of 10 cu. ft. The dredge was built by the Yuba Company of San Francisco and is electrically operated.

The big plant was christened by Mrs. T. W. Thompson, wife of the general manager and chief engineer, who named the dredge the Mosier No. 2, honoring A. E. Mosier of Kansas City, president of the dredging company and of the Lucky Tiger Company, the parent corporation.

Canadian Collieries Acquires Mine

The properties of McLeod River Hard Coal Co., west of Edmonton, Alberta, have been purchased by Canadian Collieries (Dunsmuir), Ltd., and will be operated by a new company to be known as the McLeod River Hard Coal Co. (1941), Ltd. The British Columbia company will combine the sales forces and distribution systems of both companies to keep down costs. With this acquisition Canadian Collieries is now marketing fuel in all Canadian provinces from British Columbia to Ontario. The McLeod River mine is working in a seam 8 ft. thick, with estimated reserve of 10,000,000 tons, and two other seams are expected to contain as much more. The property consists of approximately 1,700 acres and the present equipment allows a production of almost 200,000 tons a year. The new management intends to increase production greatly over the present output.

With the COAL DIVISION

of the AMERICAN MINING CONGRESS

PREVENTION OF ROOF FALLS IN COAL MINE ENTRIES

● *An Announcement of a Study to be Made by the Committee on Roof Action*

By G. B. SOUTHWARD
Mechanization Engineer

A certain amount of roof falls in coal mining has always been considered a necessary evil, but perhaps roof falls in entries are not as necessary as we have supposed. Certainly the cost of cleaning up slate on haulways and air courses is a considerable expense and, with rising labor costs, will become more serious in the future. For this reason, the time has come to give this matter more thought, and since progress can only be made by the acceptance of new ideas, a first step is to discard the traditional idea that roof falls cannot be avoided.

Digressing for a moment from roof falls in order to illustrate the point in mind, suppose we consider the matter of haulage wrecks. Not so long ago mine car derailments were regarded as inevitable, and no one paid much attention to them. In those days the cars were light in weight, haulage was mostly by mules or horses, and a derailment could be replaced so quickly by the driver that mine operators were not justified in spending much money for track improvements. However, in more recent practice, with motor haulage, handling large capacity cars and big trips, delays from wrecks are a large expense. Profiting by the experience of the railroads, mines began to use proper materials and construction methods in their haulage road installations. As a result, in a modern operation, mine cars are seldom derailed—proof that wrecks are not unavoidable.

Causes of Roof Falls

Coming back to the question of mine roof, many mines in our country are blessed with good top. When a mine has good roof, the top rock has two natural characteristics; it is strong enough to span the width of the entry, and its strength does not deteriorate on exposure to the action of water or the mine air. Other mines are not so fortunate and their top lacks one or both of these natural characteristics; in such cases, a possible preventative of falls is to supply, by artificial means, the lacking quality.

Here it might be well to state that where a roof does not appear to have the necessary strength to span an entry, the failure may not be a natural characteristic, but may be caused by the fact that the top is shattered or weakened by the explosive used in blasting down the coal. In many such instances, cutting the coal in the top will prevent the shock of the explosive from affecting the overlying strata.

A most serious cause of slate falls is from deterioration of the top rock, which we are accustomed to say is due to "air slacking." However, it has been definitely proven in a number of cases that "air slacking" as we understand it really does not exist, and the roof failure may be due to one of several other reasons, such as oxidation of pyrites in the rock, temperature changes, the expanding action of absorbed water, etc. Or, there may be a combination of two or more of these factors.

Investigation of Roof Spalling

Experiments have already demonstrated that sealing the roof, to preserve its original condition, has in certain instances been very successful. There have also been cases where this remedy has failed. This indicates that the sealing material must be selected to combat the particular form of deterioration existing at each individual mine; one certain type—gunite, paint of various kinds, etc.—might be successful or, on the other hand, it might contain ingredients actually harmful to the roof rather than beneficial. For example, some roofs are "allergic" to concrete or gunite because the water in the mixture is absorbed by the rock with a resultant swelling or expansion.

There is so much contradictory and conflicting evidence in roof behavior that, before preventive measures can be found, the reasons for the roof failure must be carefully investigated by means of chemical analysis, microscopic examination, etc. The Roof Action Committee of the American Mining Congress Coal Division has recently organized a subcommittee to undertake such a study, under the chairmanship of H. B. McNary, Consulting Engineer of the New River Company. Associated with him are Dr. Paul Price, West Virginia State Geologist; Dr. Hans Neuberger of Penn State College, and H. P. Greenwald of the U. S. Bureau of Mines. Collaborating with them are several coal companies in West Virginia, Pennsylvania and Ohio and, according to present plans, a series of investigations will be conducted in the mines of these companies, examining the roof and testing preventive measures. Final conclusions and recommendations can not be predicted, but we can be sure that the work will be carried on in a thorough and systematic manner and, if an answer to roof trouble can be found, this committee will find it.

INSTALLATION COSTS OF SERVICE HAULAGE TRACKS FOR MOBILE MECHANICAL LOADING

● ***A Preliminary Report of the Haulage Roads Committee.***

A study is being made by the Haulage Committee on service haulage tracks for mobile mechanical loaders, in order to determine what the track costs of a modern installation should be, and to show what methods and material are most economical. This study is based on actual installations now in operation in coal mines and will cover the track materials used, the methods of construction and the costs of the material and the labor for installation and removal.

Table No. 1

The first part of this study is a compilation of track cost figures for mechanical loading that have been furnished by a number of coal companies in several different states; this compilation is presented in Table 1. Table 1-A covers mines that use track mounted machines entirely for cutting and loading; the operations in Table 1-B, for the most part, have tractor loaders with either shortwall or track-mounted cutters.

The figures given in the table are not the actual "per ton" costs as shown in the monthly statements of the mines. Because of different seam heights and other conditions, the production at these mines varies from 25 to 60 tons per working place—an average of 40 tons; so, for purposes of comparison in the committee study, the original costs were reduced to this average tonnage basis, and the figures shown in the tabulation are calculated estimates of what the track costs per ton would be if each mechanical loading operation produced 40 tons from a working place. It is of course understood that many variable factors determine the cost of track work, and these figures are presented merely as a preliminary, to indicate the range of track costs in some typical operations.

Table No. 2

The final report of the committee will include complete details on a number of mines, showing types of track material, construction methods used, and general results. In addition, actual cost figures will be submitted covering the material and the labor. Table 2 is a compilation of four such reports already gathered by the committee from mines in three states; the figures shown are self-explanatory to a large degree, but a brief description of each operation is necessary for an understanding of the differences indicated in the amount and cost of track material and labor. All of these mines use track-mounted mobile loading machines, as well as track-mounted cutters and trolley reel gathering locomotives, but their mining systems are quite different.

Mine No. 1 is an operation in rooms, without pillar recovery and without switches or crossovers in the breakthroughs between the rooms. Mine No. 2 has a room and pillar system with rooms 26 ft. wide on 44 ft. centers; switches between adjoining rooms are laid through the crosscuts for the car changes, so that the maximum car change distance is 150 feet. Mine No. 3 uses a room and pillar system with the room pillars recovered with the loading machine. Mine No. 4 covers a panel of block system development, and the figures in this report are for entry driving only. Instead of moving the cross entry tracks ahead, this material is left in place for the retreat work; consequently, the material cost figures will be lowered considerably from those given in the report when the pillars in the panel are recovered.

Costs from Table No. 2

The "Amount and Cost of Track Material" gives the figures for a typical operating panel and covers the amount and purchase price of the material actually in use. This figure of course is not the real material cost chargeable to the operation, as, particularly under modern procedure, great care and attention is given to the salvage and reuse of rail ties, switches, etc. In other words, as soon as a room is completed, the track is immediately recovered and moved ahead to a new location; this means that the material is used several times in a panel and is later transferred to a new entry when the panel is completed. As a result, the original purchase value is divided by a factor which represents the number of times that each type of material is re-used. This is shown in the last group of items in the table entitled "Cost of Track Material and Labor," where the first two lines give the original purchase value, and the amount actually charged to the unit panel.

TABLE 1

COMPILATION OF TYPICAL SERVICE HAULAGE INSTALLATION COSTS

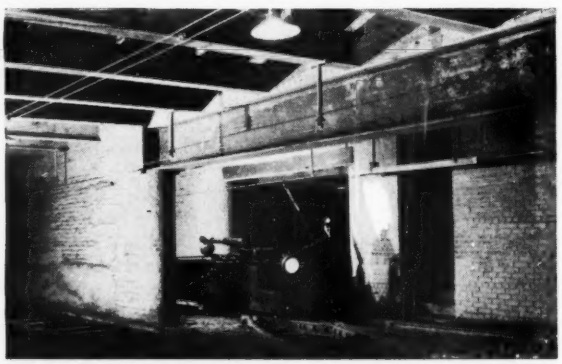
TABLE A — *Mines Using Track Mounted Cutting and Loading Machines*				TABLE B — *Mines Using Tractor Loaders with Shortwall or Track Cutters*			
Mine	Track Material Cost	Track Labor Cost	Total Track Cost	Mine	Track Material Cost	Track Labor Cost	Total Track Cost
A	$.033	$.049	$.082	J	$.029	$.085	$.114
B	.041	.061	.102	K	.032	.041	.073
C	.019	.090	.109	L	.020	.050	.070
D	.015	.080	.095	M	.033	.064	.097
E	.003	.030	.033	N	.019	.050	.069
F	.021	.048	.069	O	.033	.086	.119
G	.026	.042	.068	P	.013	.049	.062
H	.034	.095	.129	Q	.026	.042	.068
I	.025	.075	.100	R	.009	.033	.042
				S	.034	.042	.076
				T	.037	.100	.137
Average	$.024	$.063	$.087	Average	$.026	$.053	$.079

TABLE NO. 2—TRACK MATERIAL DATA AND LABOR COSTS FOR SERVICE HAULAGE INSTALLATIONS

	Mine No. 1	Mine No. 2	Mine No. 3	Mine No. 4
General				
Mining System	Room and Pillar	Room and Pillar	Room and Pillar	Block Development
Seam Height	5 ft.	6 ft.	5 ft.	7 ft.
Character of Top	Draw Slate	Shale	Good	Good—Fair
Character of Bottom	Hard	Soft when wet	Good	Soft after exposure
Equipment				
Type Loader	Track Mounted	Track Mounted	Track Mounted	Track Mounted
Type Cutter	Track Mounted	Track Mounted	Track Mounted	Track Mounted
Type Locomotive	Trolley Reel	Trolley Reel	Trolley Reel	Trolley Reel
Type Mine Car	Steel—3⅓-ton cap.	Steel—10-ton cap.	Steel	Steel—5½ tons
Track Gage	42 in.	42 in.	42 in.	
Entry Track Material				
Rail—Weight and Length	40-lb.; 30 ft.	35-lb.; 20 ft.	30-lb.; 30 and 15 ft.	50-lb.; 30 ft.
Splices	Angle bars	Angle bars	Angle bars	Angle bars
Ties and Spacing	Steel-wood—20 in.	Heavy Steel—24 in.	Steel—36 in.	Wood—24 in.
Turnouts	No. 2½	No. 2 and No. 2½	No. 2	No. 1¾
Switch Ties	Steel tie sets	Steel tie sets	Steel tie sets	Wood—interlaced with steel
Room Track Material				
Rail—Weight and Length	30-lb.; 18 ft.	35-lb.; 20 ft.	30-lb.; 15 ft.	30-lb.; 15 and 30 ft.
Splices	Angle bars	Angle bars	Half angle bars	Fish plates
Ties and Spacing	Steel—36 in.	Heavy Steel—24 in.	Steel—36 in.	Steel—24 in.
Turnouts	None used	No. 2 and No. 2½	No. 2	No. 1¾
Switch Ties	None used	Steel tie sets	Steel tie sets	Steel
Installation and Maintenance				
Is rail length related to room centers?	No	No	Yes	No
Are curved rails pre-bent before laying?	No	See Note A	Yes	No
Cause of ultimate rail failure		Crystallization		Breakage
Cause of ultimate tie failure	Derailments		Derailments	Wood—spike killed
What equipment is hardest on track?		Loading machine	Cutting machine (Note C)	Cutting and loading
Does track material give adequate service?	Yes	Yes	Yes	30-lb. rail too light
Recent changes in track material		Use of steel ties	None	
Remarks				
Amount and Cost of Track Material				
Rail	60 tons...$2,908	60 tons...$2,600	145 tons..$6,308	102 tons..$4,251
Splices	570 388		1,760 pairs. 249	904 362
Bolts	6½ kegs.. 59		11 kegs.. 165	6 kegs.. 59
Wood ties	1,244 1,492			1,850 389
Steel ties	1,685 1,395	2,500 1,800	4,250 3,188	2,500 1,748
Turnouts	26 912	36 1,600	150 6,000	41 1,368
Cost of Track Material and Labor				
Original value of material in use	$7,155	$6,000	$15,900	$8,248
Amount charged to unit panel	1,115	(Note B) 270	4,664	1,281
Labor cost of track installation	3,804	1,500	7,029	10,571
Labor cost of track removal	1,572	750	1,200	
Total cost of track in panel	5,376	2,520	12,892	11,852
Acres of solid coal in panel	18	15	30	39½
Cost of track, per acre of coal	355	170	430	300

Note A—Rooms turned 45° eliminating curved rails.
Note B—Material is re-used three or four times during life of panel and loss of material is very low.
Note C—12 in. kerf cut in hard boney

The final figure in the table, "Cost of Track Per Acre of Coal," was adopted by the committee as a means of furnishing a direct comparison between mines with different seam heights. The cost per ton is directly determined by the amount of coal mined, and therefore, a thin seam operation might actually have a more efficient service haulage installation than a mine in a thicker seam, but the "per ton" cost would not indicate this. The "cost per acre" eliminates the seam height factor.



There are of course other considerations that have to be taken into account in comparing the figures in Table 2. The mining system, the width of the working places, the percentage of pillar recovery and methods of extracting the pillars, all have some effect on the track costs. It should be kept in mind that the figures in the tables are not accurate for direct comparisons, but the reports do serve to illustrate modern service haulage track construction methods and show what results are had in some typical mechanical loading installations.

Defense Activities of the RFC

(*Continued from page* 33)

plies together with other natural and shipping advantages. So it is in connection with other products acquired —there will be an increased activity in the many fields to which they are related.

New Demands Constantly Arise

New demands in all fields are the consequence of the defense program. It has imposed a gigantic burden upon the world's shipping facilities, felt especially in connection with bulky ores such as chrome and manganese. During ordinary times there were sufficient bottoms for normal freight traffic and shippers were ready and eager to carry cargoes. But new ships cannot now be built to keep pace with demands for cargo space. Space being at a premium, rates are forced up and a master who would ordinarily gladly go to another port to load chrome or manganese ore, at comparatively low freight rates, would rather pick up products bringing a high return—like ilmenite used in paint manufacture, or sugar. However, today, under new legislation, the Maritime Commission has this situation in hand. It has inaugurated a system of shipping control, and with the cooperation of private owners and agents the most efficient use of available tonnage is being arranged.

Until this condition is entirely righted, however, by regulation or otherwise, private industry is at an extreme disadvantage. Most industries cannot tie up capital by purchasing and stockpiling materials in foreign ports of call to await the chance arrival of a ship that is willing and able to carry them. Only a Government agency, such as RFC, can afford to follow the procedure of acquiring and waiting. Scarcity of bottoms means increasing difficulties. Of late this has meant more and more work for the Government.

The foregoing has made the mineral and metals problem particularly difficult. Adding to this difficulty, the defense program has been stepped up to a pitch not foreseen and hence the stockpiling program with respect to all metals except tin and manganese has had an additional burden placed upon it. In those cases where stockpiles have been acquired, some interesting situations come to light. For example, not so very long ago, industries packing their products in tube containers made of tin were told to decrease the use of tin and it was suggested that lead be used as a substitute. However, upon investigation, it was found that in the country at that time tin was more readily available than was lead.

It is our belief that the continued efforts of everyone will result in satisfactory readjustments and in adequate results.

Training Personnel

(*Continued from page* 36)

man, track layer or driller where the drilling is being done outside of the mechanical loading crew.

Apprentice System Used in Training Shop Men

We use the apprentice system in training machinists, electricians, and welders. This apprenticeship covers six periods of six months each. At the end of each period, a man's rate of pay is increased until he has completed three years when he becomes a journeyman.

Training is continued on through the supervisory staff. As mentioned before, the unit foremen are selected, as far as possible, because they have demonstrated a marked ability as leaders in a crew. By this time a man usually has shown some ability in handling men. Unit foremen who are to be assigned to districts working shaking conveyors are usually chosen from conveyor crews. The same is true of unit foremen being chosen for mobile type loaders, although it is possible in mines using both conveyors and mobile type loaders that a man chosen for unit foreman will have experience in both types of work. When a man becomes a unit foreman, he is given a Book of Standards which sets forth definite methods by which the work is to be done.

Weekly Staff Meetings are Held

Foreman training other than what he acquires underground is made possible through weekly staff meetings. These meetings are conducted by the district superintendent and are attended by unit foremen, mine foremen, machine bosses and resident engineer. These meetings are frequently attended by general office officials. Mining and safety problems are discussed.

During the winter months foremen training classes are also held in each district. Usually one of the staff other than the superintendent is designated as the leader in these meetings. Mining problems are taken up and discussed in detail. Once a year a meeting of all supervisors in the district, together with all general office officials, is held in connection with a dinner, at which the policy of the company is set forth by the vice president, operation. This meeting has been found helpful in making all supervisors feel that they are important members in the organization, and that the company depends upon them for efficient operation and maximum safety.

General Superintendent Meets with Staff Each Day

A practice that has been recently inaugurated by the general manager of calling to his office the general superintendent, chief engineer and safety engineer at the close of the shift, has proved very efficient in keeping in touch with the daily problems as they occur in the different mines. Generally speaking, each of the above four men visits a different district daily. This practice I can personally recommend in keeping the general office supervisors in constant touch with the problems confronted in the mines, allowing them to get a grasp on any situation that appears to be getting out of hand.

It is our aim to give every man as thorough training as possible in all phases of mining, thus preparing him to be master of a situation rather than a victim of it.

Australian Coal Industry Controlled

It is reported from Canberra that in Australia profits derived by owners from coal mines may be limited to 8 per cent per year under the national security coal control regulations. Before limiting the profits the Government will make allowances for amortization, depletion, depreciation, fires, falls of coal and other extraordinary occurrences; and also other recognized expense.

The newly appointed Commonwealth Coal Commissioner has been given wide powers under the regulations and will control production, treatment, handling, supply, distribution, storage, marketing and the use of coal, and he may particularly control the opening of new mines and the re-opening of abandoned mines.

The Government's plan to rationalize the industry has been criticized by employers and employes, but it is reported that the owners will cooperate with the Government to assist in making the plan workable.

WHEELS of Government

● *As Viewed by A. W. Dickinson of the American Mining Congress*

NOW that the place of the United States in the international picture has apparently settled down to keeping the sea lanes open for sending our lend-lease munitions and supplies to Britain, Russia, China, and others, the Senate and House of Representatives may end their long vigil and adjourn the present session of the Congress, in order that the tired legislators may return to their homes for Thanksgiving. Barring unforeseen emergencies, the Congress would not resume until the second session, early in January.

The nearness of the coming adjournment, probably by November 15, will undoubtedly result in the deferment of the Administrative Provisions Revenue Bill, Social Security expansion moves, the Rivers and Harbors "pork-barrel" Bill, embodying the St. Lawrence seaway and power project, and also quite probably price control legislation. While hearings have closed on the price control bill, and the House Committee on Banking and Currency is expected to report some form of a measure almost any day now, there seems to be a division of opinion in Administration quarters on the extent of coverage of price control. Secretary of Commerce Jesse Jones, who also retains his office as Federal Loan Administrator, has recently stated that the desired objective is the control of all factors which are involved in present price conditions. An unbiased analysis of these words would indicate that the very able Mr. Jones believes that control of wages should accompany any control of prices. It has been generally believed that the action taken by the Canadian Government placed a definite control over both prices and wages, but Price Administrator Leon Henderson has filed a report stating that the Dominion of Canada did not freeze wages; the action establishes a wage base period and provides for changes related to the cost of living. The fact remains that in the majority of Administration sources the desire is to avoid any fixing of wages, as this subject is politically "hot."

Washington Highlights

CONGRESS: May adjourn until after the New Year.
PRICE CONTROL: Congress wary of fixing wages in proposed bill.
NON-DEFENSE EXPENDITURES: Possible economies studied by joint committee from Senate and House.
MINING PRIORITIES: Order P-22 amended to include placer gold mines.
COAL MINE INSPECTION: Careful selection of personnel defers field action.
ARGENTINE TRADE TREATY: Tungsten ores and concentrates not subject to reduction of duty.
DEFENSE STRIKES: Congress considering corrective measures.
COPPER CONSERVATION: Order M-9-c prohibits non-defense use of copper after January 1.
COAL PRODUCTION: For first 43 weeks of year estimated increase 39,000,000 tons over last year comparable period.
ALLOCATIONS: SPAB announces coming transition from priorities to allocations.
FUEL CONTROL: Ickes appointed co-ordinator for all fuels.
TAX CHECK-OFF: Morgenthau proposes monthly deduction of income taxes from payrolls.

Economy Studies

In the Revenue Act of 1941, approved by the President on September 17, provision was made for a joint committee of three Senators and three Representatives, respectively, from the Senate Finance and Appropriations Committees and the House Ways and Means and Appropriations Committees, to study and recommend upon economies which may be effected in the non-defense expenditures of the Federal Government. This Non-Defense Fund Committee has now been appointed and has elected Senator Byrd of Virginia as Chairman. An appropriation of $10,000 has been made to cover the cost of its investigations. The personnel of the committee is composed of:

Senate

Walter F. George, Georgia.
Harry Flood Byrd, Virginia.
Robert M. LaFollette, Jr., Wisconsin.
Carter Glass, Virginia.
Kenneth McKellar, Tennessee.
Gerald P. Nye, North Dakota.

House

Robert L. Doughton, North Carolina.
Thomas H. Cullen, New York.
Allen T. Treadway, Massachusetts.
Clarence Cannon, Missouri.
Clifton A. Woodrum, Virginia.
John Taber, New York.

As a beginning for the committees' work, the Bureau of the Budget has furnished a report setting forth suggested reductions in non-defense expenditures in the amounts of one billion, one and a half billion, and two billion dollars. These reductions affect many departments and agencies of the government, but the chief of those which would be slashed include civil departments and agencies, public works program, aids to agriculture, aids to youth, and work relief. What the committee may be able to accomplish is a matter for conjecture, but its creation is a step in the right

direction, which has been advocated by the American Mining Congress for several years. The committee Chairman, Senator Harry Byrd of Virginia, is well known for his sound thinking and for his advocacy of economy in the conduct of our Federal Government.

Machines and Supplies

Administrator of Mining Priorities Wilbur Nelson and his able and hard-working staff are continuing to care for the mining industry in the OPM Division of Priorities under the authority granted by Preference Rating Orders P-56 and P-23. At a meeting held in Cincinnati on September 19, over one hundred mining machinery manufacturers operating under the P-23 order devoted a full day to discussion of the P-23 and P-56 orders with Shaw Livermore and R. W. Shannon of Dr. Nelson's staff. At the Metal Mining Convention and Exposition in San Francisco on October 2, Dr. Livermore also addressed a very large meeting of metal mine operators and held numerous personal conferences to consult and advise with the men of the industry.

When the P-56 order was issued it specifically excluded gold placer mines, and it was hoped that these operations would be covered in the amended issue of the P-22 order, but when the latter order was issued on October 16 such was not the case. Subsequently a ruling has been obtained which authorizes the inclusion of placer gold mines under Order P-22, as amended. This letter reads in part:

"The American Mining Congress
"Munsey Building
"Washington, D. C.

"GENTLEMEN:

"This will acknowledge your letter of November 3 confirming our several conversations with reference to Preference Rating Order P-22 AMENDED.

"Please be advised that the operation of placer gold mines is now included under Preference Rating Order P-22 AMENDED as of the effective date, October 16, 1941.

"Very truly yours,

"DEAN C. GALLAGHER,
"Maintenance & Repairs Section, Priorities Division."

The above action by the OPM removes a discrimination which was particularly harmful to large communities in Alaska, California, and other parts of the West.

It is understood that the first work in the field checking of inventories at manufacturing plants is being undertaken in part by field agents of the Wage-Hour Division, Department of Labor. Inasmuch as the U. S. Bureau of Mines has two inspection jobs on its hands, one for safety precautions and the other covering the handling of explosives under a law soon to be enacted, it would seem economical of time and expense to have these field men of the Bureau of Mines handle the field checking of inventories of supplies and equipment at the mines. Representations to this end are being made to the Bureau of Mines and to the Mining Priorities Division of the OPM.

Argentine Trade Treaty

Announcement in mid-October, by the State Department, of the consummation of a reciprocal trade agreement with Argentina omitted any mention of tungsten ore or concentrates. Several months ago when the State Department announced its intention to negotiate a foreign trade agreement with Argentina, the list of commodities subject to negotiation for a reduction of as much as 50 percent in import duty included tungsten ore and concentrates. Senators and Congressmen, as well as producers from Arizona, Colorado, Idaho, Montana, Nevada, and Utah, appeared in person before the Committee for Reciprocity Information and voiced their protests at the inclusion of tungsten on the negotiable list. Strong representations were also made to the Secretary of State from numerous congressional sources. It is apparent that this cumulative effort, aided perhaps by wise counsel from the War and Navy Departments, the OPM and the Reconstruction Finance Corporation, prevailed against the ill-advised efforts to reduce protection on a vital defense material in which the United States has attained a substantial degree of self-sufficiency.

Slow Down St. Lawrence

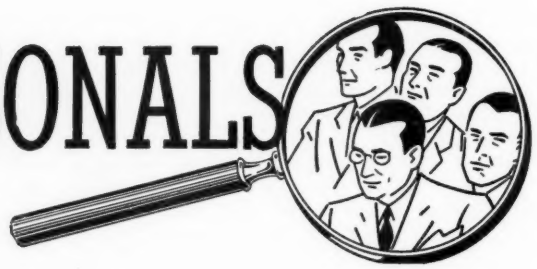
Consideration of further projects which are loading down the Rivers and Harbors "pork-barrel" Bill have delayed the reporting of the measure by the committee. The latest project undergoing hearings is that of the Coosa River in Alabama and, while the omnibus measure may be reported by the time Congress adjourns in mid-November, its further consideration must go over until the second session in January. Even after this omnibus carrier of the St. Lawrence seaway and power project is reported by the Committee on Rivers and Harbors, it must run the gauntlet of the House Committee on Rules, where it is quite probable that an open rule will be granted, permitting amendments on the floor of the House which may delete a number of the projects contained in the big "pork-barrel." An odd feature of this controversial legislation is the naming of $1,200,000,000 as the amount necessary to cover all the contained projects; whereas creditable estimates of the cost of the St. Lawrence seaway and power project either equal or exceed that sum.

Production and Labor Troubles

Labor controversies resulting in stoppages of work in shipyards, airplane factories and other defense activities have been brought to a focal point in the "captive" coal mine strike trouble between the steel producing companies and the United Mine Workers of America. Upon the resumption of work at the captive coal mines, negotiations for a settlement of the controversy were renewed; but criticism of the stoppage of defense work has long been severe in the House and Senate, and the recent troubles have resulted in the introduction of a number of corrective measures. Senator Bailey of North Carolina is endeavoring to place an amendment in the Neutrality Act Repeal Resolution, which would make the stoppage of work in a defense industry an act of sabotage, punishable by fine and imprisonment. Senator O'Daniel of Texas would amend the Constitution of the United States to provide that "No person shall be denied employment because of membership in or affiliation with or resignation from a labor union, or because of refusal to join or affiliate with a labor union; nor shall any corporation or individual or association of any kind enter into any contract, written or oral, to exclude from employment members of a labor union or persons who refuse to join a labor union, or because of resignation from a labor union; nor shall any person against his will be compelled to pay dues to any labor organization as a prerequisite to or condition of employment."

From this it is evident that the desire for some form of remedial action or legislation is strong at the Capitol, and while there may be no enactment in the few days remaining in the present session of Congress, it is entirely possible that some stringent action may be taken in January or February.

PERSONALS



Robert Clarkson has accepted a position as general superintendent of the Calistoga Mining & Development Co., at Klondyke, Ariz. He was formerly superintendent of the Indian Valley Mining Co., at Greenville, Plumas County, Calif.

Michael Girod has been appointed superintendent of the H. C. Frick Coke Company's Leisenring group of mines, north of Uniontown, Pa. The three mines are being reopened after having been closed for a number of years.

F. Cecil Baker has been elected president of the American Potash and Chemical Corporation, succeeding **H. S. Emlaw**, who has resigned. Mr. Baker has been vice president of the company for many years.

Carl E. Egeler, an executive engineer for the General Electric Company at the Nela Park engineering department, and a lieutenant-commander in the U. S. Naval Reserve, was recently called to service as resident inspector of naval material at Munhall, Pa.

Charles W. Spence has been appointed chief metal mine inspector for the Industrial Commission of the State of Utah, succeeding **E. A. Hodges**, who has resigned to enter private business after holding the office for 19 years. Mr. Spence has a long record of experience in Utah and Wyoming coal and metal mines, and for 12 years was foreman of the Utah Apex Mine. He has served in the state legislatures of both Utah and Wyoming, and this year was a member of the Utah Senate.

James M. Layman has been instrumental in organizing the Silver Plate Mining Company and has combined several properties near Jerome, Ariz., under company control. **A. Syverson**, formerly geologist and engineer for United Verde Extension Mining Company, has been named superintendent for the exploration and development of these properties.

Myl[illegible] Walsh has been named assistant mine superintendent at the Fairview Collieries Corporation, Fairview, Ill. He formerly held the same position at the Ayrshire Patoka Collieries Corporation in Brazil, Ind.

Robert S. Sanford, mining engineer with the U. S. Bureau of Mines, formerly at Tucson, Arizona, has been transferred to Alaska, where he will examine chrome deposits.

Lewis S. Prater has been named assistant metallurgist in the Idaho Bureau of Mines and Geology at Moscow.

E. H. Hebden, formerly with the Jeffrey Manufacturing Company at Huntington, W. Va., in charge of conveyor installations, has taken a position as mine superintendent with the Rochester & Pittsburgh Coal Co.

S. G. Blaylock, president of Consolidated Mining and Smelting Company of Canada, Ltd., has been appointed a director of West Kootenay Light and Power Co., Ltd., in place of the late **Hon. Arthur B. Purvis.**

Julian E. Tobey, vice president of Appalachian Coals, Inc., was recently elected a director of that organization. He is chairman of the Coal Division of the A.I.M.E., chairman of the Technical Advisory Committee for Bituminous Coal Research, Inc., and a member of the Ohio State Board of Registration for professional engineers.

Frederick MacCoy, consulting engineer of California, has returned from Panama, where he carried on investigations in the Capira district for the Panama Corp.

Charles P. Knaebel, formerly superintendent of Cia. Aurifera Saramarca, at Lima, Peru, has returned to the United States, and is located at Silver City, N. Mex.

Geo. W. Nicolson, who has returned to the United States after several years as superintendent for Cyprus Mines Corporation on the Island of Cyprus, is now mine superintendent for the Christmas Copper Co. at Christmas, Ariz. **M. Jordan Nathason**, who has also returned to the States after four years with the Cyprus Mines Corporation, is now employed by the Cactus Mines Company at Rosamond, Calif.

C. E. Arney of Boise, Idaho, has been appointed by Governor Clark of Idaho as Priority Division mining coordinator for the State. The appointment is the result of a recent ruling of the OPM, setting up regional offices under **Wilbur A. Nelson**, OPM's chief mining coordinator.

Joe McNeill, graduate of the Colorado School of Mines and formerly employed as a metallurgical engineer in Rhodesia, has been awarded the military cross by the British government in recognition of conspicuous gallantry as a member of the British army in Africa.

Charles E. Whitehead, president of the Fuel Merchants Association of New Jersey, recently presided as chairman at a meeting of the Retail Solid Fuel Executives Committee in New York, at which time plans were discussed for the organization and appointment of representation for the industry in Washington, D. C.

D. J. Shelton, formerly vice president of the Marion Steam Shovel Co., has been elected to the presidency of the company, succeeding **J. H. Watters**, who has resigned. **Alex Gibson**, formerly treasurer, has been made vice president.

D. J. Shelton

Mr. Shelton takes over the management of a company for which he has worked for 32 years. Starting in as a shop maintenance man, he advanced steadily to assistant chief engineer, to chief engineer, and to vice president. As vice president, he was at first in charge of sales and engineering, a responsibility which was later extended to virtually every department of the company.

Dodge Freeman has been made assistant superintendent of the Peabody Coal Company mines in the Taylorville district of Illinois. For the past two years he had been working out of the Taylorville district office of the company as an engineer.

W. E. Wheeler has been appointed safety inspector and employment agent for the Eastern Coal Corp., Stone, Ky., in place of **W. A. Eades**, who has resigned. Mr. Wheeler was formerly senior inspector for the Kentucky Department of Mines and Minerals, stationed at Pikeville, Ky.

Robert G. Bassett, who was assayer and sampler at the Cornucopia mine for a number of years, has been appointed analyst at the Oregon State Assay Laboratory at Grants Pass, succeeding **Albert A. Lewis**, who resigned to become engineer with the Denver Equipment Company.

M. C. Marquard is in charge of operations of the Rustless Mining Corp., at the company's property in the Chrome district of Glenn County, California, northwest of the town of Willows.

A. D. Moir, formerly mechanical engineer at the smelter for the Bunker Hill & Sullivan Mining and Concentrating Co., has been appointed as general mechanical engineer for the entire operations, including company mines and plants. He succeeds **Fred Porter,** Kellogg, Idaho, who has resigned as master mechanic for the company.

Edward I. Evans has been appointed district manager for the Republic Steel Corp., in the southern district, embracing operations at Gadsden and Birmingham, Ala. He succeeds **C. L. Bransford** of Birmingham, who has resigned.

William A. Crowfoot has been made mill superintendent and metallurgist for the Callahan Zinc-Lead Co., at Nogales, Ariz.

John P. Spielman, formerly assistant research engineer at the reduction works of Anaconda Copper Mining Co., Anaconda, Mont., has been appointed professor of metallurgy at the Montana School of Mines, Butte, succeeding **Dr. Curtis L. Wilson** in that position.

John P. Spielman

Fred E. Theobald of Victor, Colo., has been appointed deputy state mining inspector for district No. 2 of Colorado.

Arthur E. Bendelari, formerly president of the Eagle-Picher Mining & Smelting Co., recently returned to Joplin and the Tri-State district for a visit, en route to his home in Kentucky from the meeting of the American Mining Congress in San Francisco, Calif.

W. D. Haselton of Pickands Mather & Co., Duluth, Minn., was elected chairman of the mining section of the National Safety Council, following the close of the 30th annual National Safety Congress in Chicago recently. He succeeds in the position **Cadwallader Evans, Jr.,** of Scranton, Pa.

George Kerwin, who had for some time been in charge of an operation of the Newmont Mining Corporation in South Africa, is now directing operations at the Resurrection Mine, Leadville, Colo. He was at one time superintendent of Murchie Mine, Nevada City, Calif.

Arthur F. Johnson, formerly in charge of the development program at the Silver Lake mine in the San Juan district of Colorado for the American Smelting & Refining Co., is now employed in the smelting division of the Reynolds Metals Company, at Muscle Shoals.

J. Howard Bird of the U. S. Bureau of Mines station, Seattle, Wash., headed the mining section at the recent Western Safety Conference, convened at Seattle, to discuss problems in connection with the rising accident rate in the country. At the conference **John J. Curzon,** general manager of the Howe Sound mine at Chelan, Wash., had charge of the morning program, and **Milton McCall** was chairman in the afternoon.

John C. Cosgrove of Johnstown, Pa., has been appointed to head the formation of a legion for China relief in Johnstown by **James G. Blaine,** national chairman of United China Relief.

Dr. Herbert Mowery of Wallace, Idaho, was recently elected president of the Rainbow Mining Co., at a meeting in Coeur d'Alene, Idaho. At the same time **Dan Leary** of Burke, was named vice president and **L. J. Randall** of Wallace, secretary-treasurer of the Coeur d'Alene Mines Co., was elected secretary-treasurer of the Rainbow Company.

Professor Robert S. Lewis of the mining department of the University of Utah, Salt Lake City, has returned to the University after spending part of the summer in examination of different mining districts in the northwest.

William W. Miller, of Reed, W. Va., general manager of mines of the Hatfield-Campbell Creek Coal Co., was elected president of the Kanawha Coal Operators Association at the recent annual meeting in Charleston, succeeding **D. Holmes Morton** of Charleston.

Olaf Hondrum, formerly chief engineer for the United Verde Extension Mining Co., is now engaged in a geological investigation of the old Vulture mine near Wickenburg, Ariz.

J. Richard Brown, a mining engineer of Spokane, Wash., has been named as head of a committee to draft a new safety code for the mining industry of the State.

Dr. T. T. Read, Vinton Professor of Mining at Columbia University, presented the Sentinels of Safety trophy to employes of mine No. 4 of the Union Pacific Coal Co., at a recent banquet held in honor of the occasion at Rock Springs, Wyo.

Stanley O. Reichert is now assistant geologist for the Tennessee Coal, Iron & Railway Company at Birmingham, Ala. He was formerly geologist for the Bertha minerals division of the New Jersey Zinc Co.

— *Obituaries* —

Herbert S. Salmon of Birmingham, Ala., chairman of the Bituminous Coal Producers Board for district No. 13 and president of Alabama Fuels, Inc., a marketing agency, died on October 14, following an operation. Mr. Salmon had been active in the mining industry for many years, and was at one time state chairman for the Metal Mining Convention of the American Mining Congress.

He was a native of Frankfort, Ind., and attended Purdue University. In 1907 he went to Birmingham and entered the service of the Tennessee Coal, Iron and Railroad Company, after which he was mining engineer for the Woodward Iron Company. In 1924 he associated himself with Percy Cowin and formed the mining and industrial engineering firm of Salmon & Cowin, Inc., and held this connection at the time of his death.

W. W. Broughton former general freight traffic manager for the Great Northern Railway and later president of the Pittsburgh Coal Company, died on September 10 in Los Angeles, at the age of 83. Mr. Broughton had been retired for 26 years.

Otto A. Dieckmann died on September 16 at a San Francisco hospital, at the age of 36. He was general manager of the Ohio Mines Company at Gold Point, Nev., for the past seven years.

A. G. Montgomery of Cleveland, Ohio, assistant chief engineer of the American Steel & Wire Co., died on October 10 at the age of 54. He joined the company as district engineer at Pittsburgh in 1914.

E. L. Wallower, prominent capitalist and philanthropist of Harrisburg, Pa., died in early September at the age of 87 years. Mr. Wallower was a pioneer in the development of the Joplin, Mo., lead-zinc field and the surrounding districts, having made his first trip there in 1885 when he purchased 760 acres of land for mining operations. From 1906 to 1926 he was associated with his three sons in the operation of mines in the Webb City, Carterville and Dunweg districts of Missouri and the Picher-Oklahoma field.

William Beye, vice president, United States Steel Corporation of Delaware, died at his home in Pittsburgh, Pa., on October 27, at the age of 60. He was elected vice president of the United States Steel Corporation in charge of industrial relations in 1937 and upon the organization of the United States Steel Corporation of Delaware in 1938, he became vice president and general counsel.

NEWS and VIEWS

Recent OPM, OPA and SPAB Actions

The Office of Price Administration, in October, recognized the necessity of stimulating the production of zinc by means of a higher price. A price schedule was issued establishing a maximum price of 8¼c per lb. for "prime western" zinc, f.o.b. East St. Louis, and 9¼c delivered basis for "high grade" zinc. These prices amount to an increase of 1c in each case over those which have prevailed under an informal understanding with zinc producers since October, 1940. Leon Henderson, Price Administrator, said that this action represents a case where intensive study by the OPA staff has disclosed that a price increase is necessary to maintain and expand supplies.

* * * *

On October 4, the Division of Priorities of the OPM placed all supplies of lead, including domestic lead and imported metal, under full control by the Division of Priorities. The new control was provided in General Preference Order M-38, which sets up an allocation system. All foreign pig lead to augment the domestic supply is being purchased by the Metals Reserve Company and allocated by the Lead Branch of the Office of Production Management. The purpose of the new order is to extend that control to domestic lead and to formalize the action through the customary channel of the Director of Priorities.

* * * *

In one of the most drastic limitation orders yet issued by the OPM to conserve a single defense material, the Division of Priorities on October 20 imposed additional rigid controls on copper and brass through Conservation Order M-9-c, which virtually forbids the use of copper for many civilian products. Control over both domestic and imported metal and scrap was imposed in the following fashion: (1) Use of copper in more than a hundred civilian articles is restricted to approximately 60 percent of a 1940 base period until January 1, 1942; (2) use of copper in the manufacture of articles listed is prohibited after January 1, 1942, except for non-decorative plating; (3) use of copper in building construction is prohibited after November 1, 1942; and (4) use of copper in all items not listed is reduced to 70 percent of a 1940 base period.

Shortly afterward the OPA announced a program for stabilizing prices of all products made of copper, brass or other copper base alloys.

* * * *

On October 22, the Director of Priorities in a supplementary order to General Preference Order M-38, which provides for mandatory priority control of lead, ordered refiners of lead to set aside 15 percent of the November production for allocation by the Director. It was estimated that the order would set aside 6,000 to 6,500 tons of lead for allocation, in addition to the amounts allocated of the Metals Reserve Company's supply. Metal not allocated out of the priority pool for sudden defense uses during the month would be added to the government stockpile.

* * * *

Zinc scrap and secondary slab zinc prices were adjusted upward, all scrap prices were placed on a shipping point basis, and premiums were established for scrap shipments in quantity, in an amendment to price schedule No. 3, announced in mid-October by Leon Henderson, Administrator of the OPA. These increases in the scrap and secondary metal ceiling reflected the advance made previously in the price of primary zinc.

* * * *

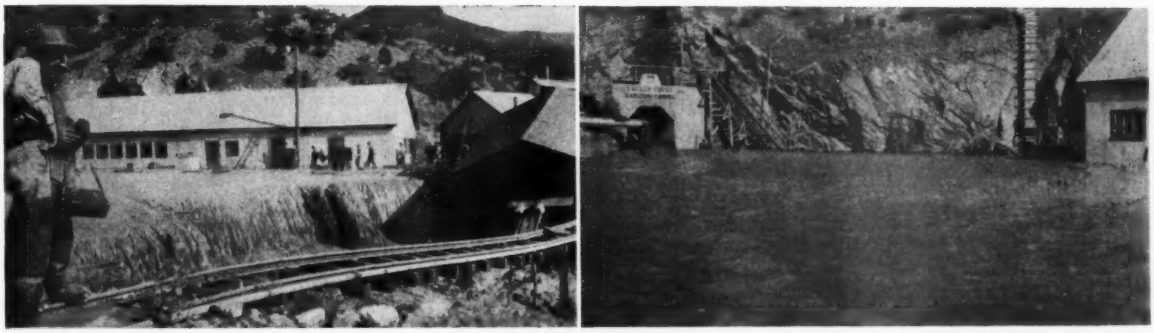
On October 9, the SPAB announced a new policy under which no public or private construction project which use critical material such as steel, copper, brass, bronze, aluminum, etc., may be started during the emergency unless these products are either necessary for direct national defense or are essential to the health and safety of the people. In effect, the new policy means that on all building projects two tests will be applied: (1) Does the construction involve the use of appreciable quantities of critical materials? (2) Is the construction directly necessary for national defense, or clearly essential for the health and safety of the civilian population?

If the answer to the first question is "yes" and the answer to the second question is "no," priorities for the critical materials involved will not be issued, according to the announcement. Where construction actually has started and a substantial portion has been completed, it was said that efforts will be made to get the critical materials needed to finish the job.

* * * *

It was recently reported in Washington that the OPA has established a higher price for the copper produced by three of the mining companies on the upper peninsula of Michigan. It is said that the Quincy Copper Company is to get 16c a pound for six months and Isle Royale and the Copper Range Companies are to get 15c a pound for the same period.

Testing to failure a 4-in. steel rope at the John A. Roebling's Sons Co. plant at the recent party in celebration of the company's 100th anniversary



PHOTOS BY MERRILL E. SHOUP

Two views of the water flow from the Carlton tunnel, Cripple Creek, Colo., when a heading tapped water in the Portland mine.

Mine Power Committee Meets

On October 21 the Power Committee of the Coal Division of the American Mining Congress met in Mount Hope, W. Va., to discuss methods of power transmission underground for conveyors and mechanical loaders. C. C. Ballard, master mechanic of The New River Co., presided as chairman of the committee, and 21 coal mine operators, department of mines' representatives and manufacturers were present.

Brazilian Steel Mill Equipped

Plans for the establishment of a steel industry in Brazil are progressing rapidly. Announcement was recently made that Col. De Macedo Soares, head of the Brazilian commission placing steel-mill equipment orders in the United States, has awarded more contracts, totaling almost $5,000,000, for mill equipment. One order was for a continuous hot strip mill and a cold-reducing, bending mill; another was for a 72-in. plate mill. A further order was placed for core-drill equipment.

Walker Mine To Close

Directors of the Walker Mining Co., a copper property in California controlled by the Anaconda Co. through International Smelting & Refining Corp., recently voted to suspend operations, at a meeting in Salt Lake City. The mine is the largest copper producer in California and has a pay roll of about 500. The reason for closing was given as inability to operate at a profit under the present price of 12 cents a pound for copper. Net loss of the company in 1940 was $290,295 on a production of nearly 5,000 tons of copper.

Domestic Heating Research Progresses

A group of 26 representatives of stove manufacturers met at Battelle Institute, Columbus, Ohio, in September to organize their group for effective cooperation with the Bituminous Coal Research, Inc., to support the program of research on stoves. J. E. Tobey, chairman of the Technical Advisory Board of Bituminous Coal Research, met with them, and at his suggestion arrangements were made for the appointment of a Technical Executive Committee to meet from time to time with a similar committee from the Bituminous Coal Research to review the results of the program and to plan for the future. A progress report on research now being conducted on stoves was discussed with the research engineers.

Floating Dragline Dredge Installed

The first California type of floating dragline dredge ever installed in Canada is that of North American Goldfields, Ltd., located at Alexandria Ferry, in the Cariboo section of British Columbia. It was built and is managed by Glenville A. Collins. The dredge commenced operations last summer and has continued on a 24-hour basis ever since. The dragline equipment is a 2½-cu.-yd. shovel operating a 2½-yd. Page bucket on a 60-ft. boom. The shovel is equipped with a 260-hp. Diesel engine. The washing plant was locally built, using native timber for the pontoon and superstructure. The plant has a capacity of 4,000 cu. yds. per day, according to reports, but since starting operations it has operated at an average of 2,500 to 3,000 cu. yds. per day, since the dragline has been used for stripping operations on a part-time basis. The area being dredged is one of the many flats along the Fraser River.

Fire Destroys Tipple

The entire surface plant of the East Gulf mine, at East Gulf, W. Va., owned and operated by the C. H. Mead Coal Co., was destroyed by fire the last of September. Work was immediately started on reconstruction, but difficulty in obtaining equipment was expected to delay resumption of operations for five or six weeks.

Scholarship Awarded

The scholarship committee of the Lehigh Navigation Coal Company recently announced the selection of Robert Gildea and Harry Kemery to be awarded college scholarships under the plan initiated last year by the company.

This scholarship program is intended to supply technically trained men in the future for various departments such as mining preparation and research and is expected to train men for key positions in the company.

Professor B. V. Moore, head of the Department of Psychology and Education, and Professor David Mitchell, head of the Department of Mining of Pennsylvania State College, were engaged to give a series of nine aptitude tests to all applicants for the scholarship. The tests given were designed to demonstrate scholastic ability, mechanical comprehension, engineering interest and personality traits. The scholarship committee is composed of several company executives and a representative of the United Mine Workers of America.

Technical Aides Needed in Metallurgy and Fuel

The United States Civil Service Commission has announced an examination to recruit technical and scientific aides for various government agencies, including the U. S. Bureau of Mines. Men and women are needed to do research and testing in the fields of metallurgy and fuel, as well as in radio, explosives, chemistry, and physics. The salary is from $1,440 to $2,000 per year.

No written test will be given. Applicants will be rated on education and experience and must show 14 units of high-school study, unless additional experience is substituted for it. In addition they must have had appropriate technical and scientific experience of high quality. Full information and application forms may be obtained from the Civil Service Commission in Washington, D. C., or from representatives at any first- or second-class post office.

Illinois Mining Institute Meets

The Illinois Mining Institute, M. M. Leighton, president, and B. E. Schonthal, secretary-treasurer, held the 49th Annual Meeting in Springfield, Ill., on Friday, October 31.

Papers presented were: "Effects of Mechanization on Safety," by C. A. Herbert, supervising engineer, U. S. Bureau of Mines, Vincennes, Ind.; "Personal Relations," by Harry M. Moses, president, H. C. Frick Coal Co.; "Our Obligation to the State Conservation Department," by Livingston E. Osborne, director, Department of Conservation, Springfield, Ill.; and "Coal Preparation Control," by Paul W. Moran, Pyramid Coal Company.

In the evening the annual dinner was held in the banquet hall of the Hotel Abraham Lincoln. The toastmaster was Dean C. M. Thompson, of the College of Commerce, University of Illinois, and the guest speaker was John D. Battle, executive secretary of the National Coal Association.

Manufacturers' wares were displayed in the exhibit hall, near the meeting room. On the following day, Saturday, many of those attending the convention journeyed to Urbana to see the Illinois-Michigan football game.

Mineral Production Mounts

A series of mineral industry survey reports, issued by the Bureau of Mines in October, reviewed the domestic production picture for the month of August in some of the important strategic minerals.

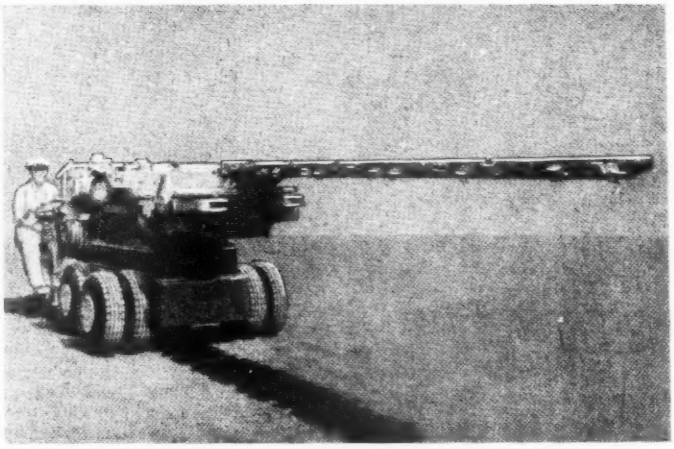
In August the domestic production of manganese ore containing 35 percent or more manganese was 9,100 long tons, shipments were 9,000 tons, and producers' stocks at the end of the month were 1,200 tons. In July production was 6,000 tons, shipments were 6,200 tons and producers' stocks at the end of that month were 1,100 tons. The rate of shipments averaged 3,344 tons monthly in 1940, when the total amounted to 40,123 tons.

Production of lead from domestic mines (including Alaska) was 36,910 tons in August, only a slight increase over July. Preliminary reports for September indicate a lead production of 37,200 tons, an increase of less than 1 percent over August.

Copper production from domestic mines (including Alaska) during August was 81,058 short tons, an increase of 1.3 percent from that of July, and the first month showing an increase over the previous month since May. September production is expected to be about 80,300 tons, a 1 percent decrease from August.

Mercury production at domestic mines in August amounted to 4,100 flasks, 100 flasks above the June rate and a new high monthly rate for many years. Consumption likewise showed gain in the revised total of 3,300 in July to 3,600 in August, but continued to be below increased mine production. Quoted prices for mercury during August ranged from $192 to $195 a flask, the lower level prevailing as the month closed.

English Pneumatic-Mounted Cutter



The English are beginning to produce equipment for trackless mining. The arc-shearing coal cutter shown is made by Mavor and Coulson. It will cut up to 10 ft. 6 in.; it has a 10-ft. turning radius and is powered from a cable reel. It has six pneumatic tires.

Production and shipments of molybdenum (element) were 3,780,300 and 4,264,700 lbs., respectively, in August, as compared with 3,354,200 and 2,961,700 lbs. in July. The average monthly rate of production and shipments in 1940 was 2,859,400 and 2,110,800 lbs., respectively.

Joint Fuels Conference

The Fifth Meeting of the Fuels Division of the American Society of Mechanical Engineers and the Coal Division of the American Institute of Mining and Metallurgical Engineers was held at the Hotel Easton, in Easton, Pa., on October 30 and 31. On Saturday, November 1, inspection trips were arranged to industrial plants near by. The banquet was held on the evening of October 31, with Howard N. Eavenson as toastmaster, and the chief speaker, E. G. Bailey, vice president, the Babcock & Wilcox Co., who spoke on the subject of "Better Utilization of Coal."

The program included papers on "Application of Chemistry to Anthracite Mine Fire Problems," by O. W. Jones and C. S. Scott, U. S. Bureau of Mines; "Domestic Stoker Coal Research," by Walter Knox, research department, Koppers Co., and J. D. Doherty, research engineer, Koppers Co.; "Effects of Changes of Moisture and Temperature on Mine Roof," by I. Hartmann and H. P. Greenwald, U. S. Bureau of Mines Experiment Station; "Automatic Burning Control in Rotary Kilns," by W. E. Reaser, professor of mechanical engineering, Lafayette College; "The Performance of Industrial Chain Grate Stokers," by J. H. Kerrick, Philadelphia & Reading Coal & Iron Co.; and "Burning Pulverized Anthracite in Steam Power Plants," by C. H. Frick, Pennsylvania Power & Light Co. Two symposiums were held; one on the "Adjustment of Pulverized Fuel-Burning Equipment" and the other on "Adjustment of Underfeed Stoker-Fired Equipment."

Shattuck Denn Mine Resuming Operations

Recently a dynamite blast set off in the Campbell shaft of the Copper Queen mine of the Phelps Dodge Corporation flooded that mine as well as the property of the Shattuck Denn Company adjoining. Deep-well pumps have been installed on the lower level of the Copper Queen to handle the heavy inflow, and it is reported that production has returned to 15 percent of normal at the property of the Shattuck Denn Company. Production will be increased as rapidly as unwatering of the shaft permits.

The flood broke loose on the 2,700-ft. level of the Junction Shaft in the Copper Queen, apparently from the blast in a drift in the Campbell shaft, half a mile away.

Mill at Copper Canyon Mine

The International Smelting & Refining Co. is erecting a mill with a capacity of 400 tons per day to treat copper ore at the Copper Canyon properties at Battle Mountain, Landers County, Nev. The plant installation follows the campaign of sampling and diamond drilling carried out by the International Co. after a working agreement had been made with the Copper Canyon Mining Co. The new plant is expected to be completed about the first of next year.

Aluminum Plant Progressing

The newly constructed aluminum reduction plant of the Reynolds Metal Co., at Longview, Wash., began production recently when the first heavy deliveries of power were made from the Bonneville Dam. The plant was built from the ground up in seven months and will produce at capacity 60,000,000 lbs. of aluminum annually. The plant began initial operation with deliveries of more than 9,000 kw. of electricity over a 35-mile line from the dam; power deliveries to the plant will be increased rapidly until the full demand of 60,000 kw. is being taken.

The new Reynolds plant and an Aluminum Co. of America plant which have been operating in Vancouver, Wash., since last September will bring Northwest aluminum production to well over 240,000,000 lbs. annually.

Plans are being drawn for the third aluminum plant to be owned and operated by the Reynolds Metal Co. This plant will be located at Listerhill, Ala., in the Muscle Shoals district, where the company already owns and operates an alumina plant and an aluminum plant producing 40,000,000 lbs. of metal a year.

National Safety Congress and Exposition

In Chicago from October 6 to 10, inclusive, the National Safety Council held the 30th National Safety Congress and Exposition. Manufacturing companies had on display a wide variety of safety devices and services.

The Mining Section held sessions on Monday, Tuesday, and Wednesday afternoons, October 6, 7, and 8. General chairman of the section was Cadwallader Evans, Jr., of the Hudson Coal Co. Vice chairmen were W. D. Haselton, of Pickands Mather & Co.; N. P. Rhinehart, Chief of the West Virginia State Department of Mines; and John Treweek, of the Homestake Mining Co. The secretary was Daniel Harrington, of the U. S. Bureau of Mines, and the program chairman for this meeting was J. J. Forbes, of the U. S. Bureau of Mines. An interesting and instructive program had been arranged for mining delegates. Papers included "Methods of Allaying Dust in Underground Mining Operations," by C. W. Owings, mining engineer, of the U. S. Bureau of Mines, with discussion by C. A. Peterson, of the Hudson Coal Co.; C. M. Fellman, of the Montreal Mining Co.; and G. R. Gardner, research chemist of the Pittsburgh Coal Co. Other papers were on the subjects of "How to Induce Men to Wear Safety Goggles," "Storage and Handling of Explosives Underground," "Electrical Safeguards and Practices in Mechanical Mining," and "Safety Practices in Some Western Metal Mines." On Wednesday the subjects were "Training Personnel in the Problems of Mechanical Mining," "Mine Safety Under War Conditions," and "Mine Safety Through the Eyes of an Insurance Inspector."

At a luncheon meeting on Wednesday, October 8, the principal speaker was T. M. Girdler, chairman of the board, Republic Steel Corporation, who warned the delegates against a Nazi brand of control over industry. He said that "there already are a number of straws in the wind that bear strong resemblance to ideas and methods common to the dictator countries." He stated that recent suggestions have been made that the government place precisely the same kind of fixed profit limitations upon industry as have long been established in Nazi Germany. He continued that "apparently there are some people in our government so cynical as to assume that profit at the expense of patriotism is the sole motivation of industry in this emergency." He also added that no one questions the need for central planning and controls during an emergency like the present, but that we must make sure the controls are not carried over as permanent policies in peace.

Morenci to Expand Immediately

The big open-pit porphry copper development of the Phelps Dodge Corporation at Morenci, Ariz., is scheduled to go into quantity production in November. This is the result of a tremendous development program which has been carried on for several years and which is continuing at an increasing pace, cost of which has been reported as $34,000,000, all financed by the Phelps Dodge Corporation.

Even before this program is completed and quantity production started, it has been announced that an additional program will be undertaken to increase the estimated production of copper by 80 percent. This further expansion will cost approximately $28,000,000 and, since it is said that details are being worked out with the Defense Plant Corporation, it is presumed that the additional capacity will be financed by that Corporation. The original production of the capacity of the plant was scheduled at 75,000 tons of copper per year; the new program would make possible production of an additional 60,000 tons per year.

Mining Investigation Commission Appointed

The Governor of Illinois has made appointments to the Mining Investigation Commission, recreated by an act of the State Legislature last June. To represent mine operators on the commission, the Governor appointed Fred S. Pfahler and A. H. Truax, of Chicago, and Thomas Greening, of Springfield. To represent the miners he appointed Ben Kunz, of Mount Olive; Voltaire Jouglett, of Stonington; and Richard McAllister, of DuQuoin. Representing the public he appointed Donald Baldwin, of Danville; E. A. Powers, of Peoria; and Robert Schott, of Quincy.

National Lead Developing Titanium Mine

The National Lead Co. is developing a mining property in the Adirondack Mountains at Tahawus, N. Y., for the production of titanium. The development is estimated to cost about $5,000,000 and work now going on includes the erection of several large concentrating units, warehouses, machine shop and miscellaneous structures. An employe housing development, comprising 31 dwellings and community buildings, is also under way. In addition, a 1,000,000-gal. reservoir and a 45-mile power line from Ticonderoga, N. Y., are being constructed. The mine, when placed in operation in 1942, will produce ilmenite, from which titanium dioxide is obtained. With supplies of this mineral from India and Africa shut off by the war, the new project will provide a domestic raw material source and at the same time contribute substantially to the industrial development of New York State. The ore will be trucked to a rail point for shipment to the company's titanium pigment manufacturing plants at Sayreville, N. J., and St. Louis, Mo.

New Tipple for Stripping Operation

The Penowa Coal Co. has awarded contract for the construction of a new tipple to the Pittsburgh Industrial Engineering Co. The plant is for the Armide stripping operation of the company near Raccoon, Pa., and will be a three-track plant with shaker screens, conveyors, and loading boom. The strip mine will be operated as soon as the tipple is completed.

High Grade Mine Erects Mill

The High Grade Mining Co., in the Tri-State district, has erected a new 150-ton mill on the Glover-Taylor land, one-half mile northwest of Chitwood. The concentrator replaces one erected by the company on the same site in 1940 and which was destroyed by fire after a brief period of operation.

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West Virginia Operators Associations Meet

The New River Coal Operators Association held its 39th Annual meeting at Mount Hope, W. Va., on October 15. The business session in the afternoon was followed by a banquet at the White Oak Country Club, where P. C. Thomas, vice president of the Koppers Coal Co., acted as toastmaster. The principal speaker of the day was Ernest L. Bailey, State Road Commissioner. Officers of the Association elected for the ensuing year were: Ernest W. Cox, president; Edward Graff, vice president; Stanley C. Higgins, secretary; and P. M. Snyder, treasurer.

On October 16 the Kanawha Coal Operators Association held the 37th Annual Meeting at Charleston, W. Va. Following the business session of the day a banquet was held in the evening at the Kanawha Country Club, at which W. C. Miller, general manager of mines of the Hatfield-Campbell Creek Coal Co. and newly elected president of the Association, was toastmaster. Other Association officers elected for the ensuing year were: A. S. Wilson, vice president, Boone County Coal Corporation; Harry Kennedy, Labor Commissioner; A. O. Wilson, statistician; John R. Dickinson, treasurer; and D. C. Kennedy, executive secretary.

In addition to the above meetings in West Virginia, the Big Sandy-Elkhorn Coal Operators Association met for the annual meeting at Ashland, Ky., on October 15, at which time all officers were reelected for the coming year. The officers are: Harry La Viers, president; L. C. Campbell, vice president; H. H. Kuhling, treasurer; and H. S. Homan, secretary.

Engineers Defense Board Formed

The national engineering societies, including the American Institute of Mining and Metallurgical Engineers, have established an Engineers' Defense Board, a new organization of engineers and technologists to deal with technical problems on shortages, substitutions, conservation, raw materials, production and reclamation in the nation-wide readjustment required under the defense effort. The initial membership consists of five representatives from each of the national societies. The board will function as a clearing house for the engineering profession on information dealing with defense, particularly in relation to shortages, and through special committees will attempt improvements of standards and practices of long standing where savings of materials can be made.

Tin Developed In Canada

According to an announcement by S. G. Blaylock, president of the Consolidated Mining & Smelting Company of Canada, the company has discovered an effective method for producing tin from the complex ore of Sullivan Mountain, source of most of the company's metal supply. The process has already been developed to a semi-commercial basis, and future progress will depend largely on the speed with which production can be stepped up to a large scale proportion. It is also reported that the company is producing enough tin for 10 percent of Canada's requirements from the Kootenay country, and that it should soon be able to produce all that Canada requires.

Soldiers Find Gold

Many of the rich mining districts of the West were discovered in pioneer days by the soldiers who were pushing civilization westward by force of arms. A modern parallel has been reported from Anchorage, Alaska, where soldiers this summer discovered gold in the Little Susitna River below Fishhook Inn, and a small scale gold rush has resulted, with five miles of the stream staked and mining started.

It is said that the find resulted from prospecting carried on for some time by groups of soldiers who had been spending week-ends prospecting the river. Participation by the soldiers has been organized in an orderly way, the officers of the post taking an active part in the staking and allocation of claims.

Tri-State Mine Modernizes

The Eagle-Picher Mining and Smelting Company is experimenting with several types of operations in the development of the Blue Goose No. 2 mine in the Tri-State district which has been recently opened. A steel head-frame, skip hoist, and surface hopper have already been installed. The underground loading is done in a shaft pocket with concrete storage hopper and air-operated chute. For the tramming, it is planned to use rubber-tired electric trucks and trailers. Change to a skip hoist from the free-swinging cable, with cans requiring a hooking operation underground and at surface, was made to reduce the time required for loading and dumping, increase the capacity of a shaft of small cross section, lessen labor, and minimize danger from rock falling down the shaft.

Nickel Deposits Evaluated

Reports were recently made by the U. S. Geological Survey on the investigation of two nickel deposits in the West.

One of these is northwest of Riddle, Douglas County, Ore. It is a blanket deposit formed by the weathering and concentration of peridotite. The original nickel content of the peridotite is believed to be in the order of 0.2 to 1 percent. The deposit has a maximum thickness of 60 to 70 ft. and it is estimated that there are some six million tons of material with an average nickel content of 1 to 2 percent, and in addition possibly 250,000 to 300,000 tons that contain 2 to 3 percent of nickel, of which 80,000 tons may be regarded as proved ore. However, it is stated that only substantially higher prices for nickel could render this deposit commercially profitable and would depend upon the development of a practicable method of treatment for low-grade nickel silicate ores.

Near Gold Hill, Boulder County, Colo., geologists of the Survey have examined a nickel deposit in an amphibolite lens in biotite schist of the Idaho Springs formation. The nickel ore occurs in the coarser-grained layers of the amphibolite, which are commonly 5 to 15 ft. thick. The grade of ore varies widely, ranging from 1.3 to 13.0 percent of nickel in the oxidized part of the deposit and from 0.48 to 6.0 percent below the zone of oxidation. It is estimated that reserves of about 25,000 tons of rock containing 2 to 3 percent of nickel have been blocked out by drifting. Other exploration has revealed that about 30,000 additional tons which may average about ½ of 1 percent of nickel, from which, by selective mining, 15,000 tons might be recovered containing 1 percent nickel.

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New England Has Ample Coal

Evidence that the coal supplies in New England are adequate for the time being has been brought out through the shortage of hydroelectric power in New England because of the drought. Several companies have stated that they have plenty of reserve boiler capacity in steam plants as well as coal supplies on hand; other companies have announced that they have large stocks of coal and not enough boilers.

Bagdad Copper Gets RFC Loan

The Bagdad Copper Corporation, operating a large low-grade porphyry copper property in Yavapai County, Ariz., has been granted a loan of $2,500,000 by the RFC. The loan will presumably be used for building a large-capacity concentrator and equipping the property for a mass-production basis. In recent years the mine has been producing to the capacity of a 200-ton mill. The concentrate is being trucked to the railroad station at Hillside, Ariz., for shipment to the International Smelter.

Arizona Small Mine Operators To Meet

The State Council of the Arizona Small Mine Operators Association will hold a meeting in Phoenix on November 22. The session will be held for the purpose of outlining the future program and policies of the Association and the State Department of Mineral Resources.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of THE MINING CONGRESS JOURNAL, published monthly at Washington, D. C., for October 1, 1941.

City of Washington,
District of Columbia, ss:

Before me, a notary public in and for the state and county aforesaid, personally appeared B. E. Chambers, who, having been duly sworn according to law, deposes and says that she is the business manager of THE MINING CONGRESS JOURNAL, and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 411, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor, and business manager are:

Name of publisher, The American Mining Congress, Washington, D. C.

Editor, Russell C. Fleming, Washington, D. C.

Business manager, B. E. Chambers, Washington, D. C.

2. That the owners are: The American Mining Congress—a corporation, not for profit. No stockholders. President, Howard I. Young, St. Louis, Mo.; Secretary, Julian D. Conover, Washington, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

B. E. CHAMBERS,
Business Manager.

Sworn to and subscribed before me this 2nd day of October, 1941.

ELSIE L. LEISHEAR,
Notary Public.

(My commission expires January 16, 1944.)

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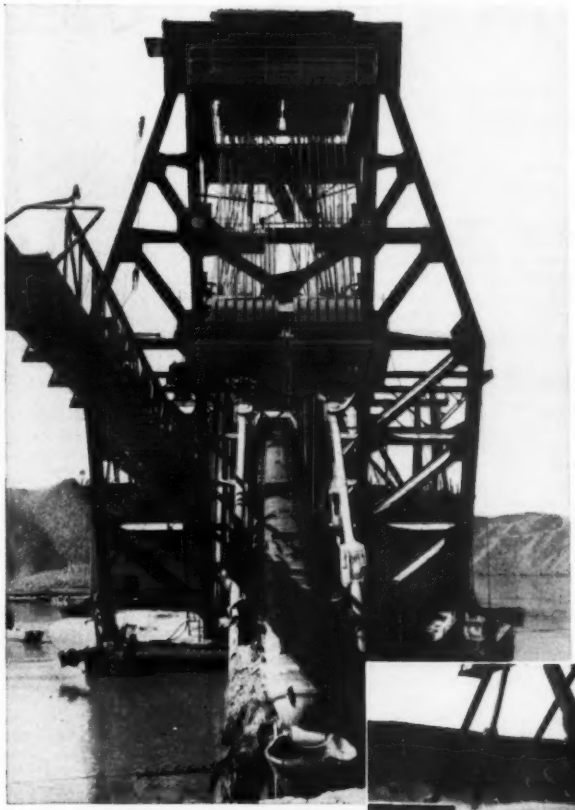

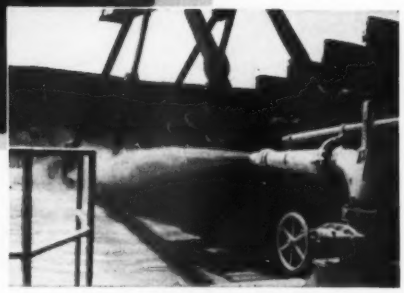

Above—Front end, Y.C.G.F. No. 20, with digging ladder raised for inspection and greasing.

Right—Eight inch monitor used primarily for knocking down high banks is also used to clean ladder and bucket-line on No. 20 for inspection.

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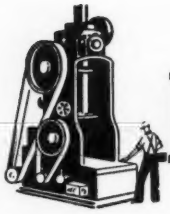


MANUFACTURERS' Forum

General Electric Equipment For Chile

Cia Salitrea De Tarapaca Y Antofagasta is obtaining eight General Electric 500-volt 40-ton industrial-type electric locomotives to be used in a big open-pit mine in Chile. The locomotives are double-truck construction, use four HM-829 series-wound motors, are equipped for dynamic braking, and have a maximum speed of 35 m.p.h.

These eight locomotives will serve three shovels. Three locomotives will be used regularly with the shovels on the three shovel tracks; three will haul trains the 5 miles between the shovel tracks and the mill; a seventh will handle miscellaneous trains; and the eighth will be a spare. The locomotives serving the shovels are to be equipped with cable reels containing 4,200 ft. of single-conductor cable.

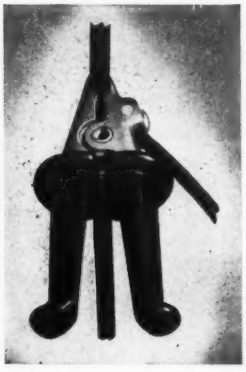
The locomotives will pull seven cars per trip. The cars weigh 15 metric tons empty and hold 30 metric tons of ore. Maximum grade is 3 percent. It is planned to handle 3,000 metric tons per 8-hour shift.

International Nickel Uses Denver Equipment

The International Nickel Co., Copper Cliff, Ontario, have placed an order with the Denver Equipment Co., Denver, Colo., for an additional 108 No. 30 (56 x 56) Denver flotation machines, which will bring the total number of Denver flotation cells for this plant up to 324.

New Junior Plier-Type Ground Clamp

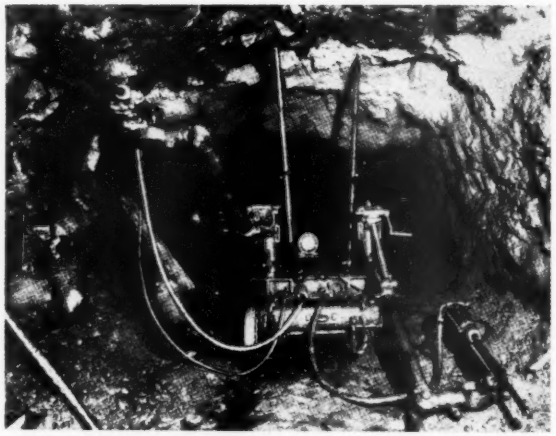
The Ohio Brass Co., Mansfield, Ohio, announces the development of a new plier-type ground clamp for effecting ground or return circuit connections to rail bond cable or rail. Known as the Junior Plier-Type Ground Clamp, it has ample capacity to handle ground connections for drills and similar equipment.



Heavy, bronze clamping jaws, actuated by a strong steel spring, provide positive mechanical and electrical connection facilities. Rubber-covered handles protect the operator. Its solderless terminal accommodates No. 4 and smaller sizes of wire. Its clamping jaw will fit No. 1 to 4/0 cable suitable for currents of 80 amp. and voltage from 250 to 600 d.c.

New Type Of Drifter Mounting

The Cleveland Rock Drill Co., Cleveland, Ohio, has announced a revolutionary design of drill-supporting mechanism known as the Model MDR mining machine.



The rig is designed to take care of one, two, or three drifters, the idea being easily, accurately, and quickly to position the drifter for proper spacing and angular directing of the drilled holes in a round. The machine is generally mounted on an ordinary mine car. Built integrally into its base are the air and water manifolds, individual line oilers for each drifter, the worm-actuated screws used for setting the drill-supporting arms, air and water control, drain cocks, safety racks, etc.

The manufacturer claims the following advantages over the usual column mounting: Much quicker and safer setting up and tearing down; the prevention of excessive wear and tear on drills due to shifting set-ups and binding steels; accurate spacing and angles of the drilled holes, resulting in up to 25 percent more rock breakage; saving the operator the heavy lifting and resulting fatigue attendant upon the usual column set-up; quick and easy withdrawal of the drilling equipment from the face when ready to blast; the facility with which the whole mechanism can be shifted to another heading so that drilling can proceed while the drilled face is being shot.

Vibro Insulators for Specialized Service

Designed for specialized services, three additional new vibro-insulators, mountings of rubber and metal to isolate vibration are announced by the B. F. Goodrich Company, Akron, Ohio.

Type 44 is for use with gas burners, Type 50 specially engineered to isolate internal combustion engines against torsional vibration and Type 60 for isolating the vibration and noise of exhaust and intake fans.

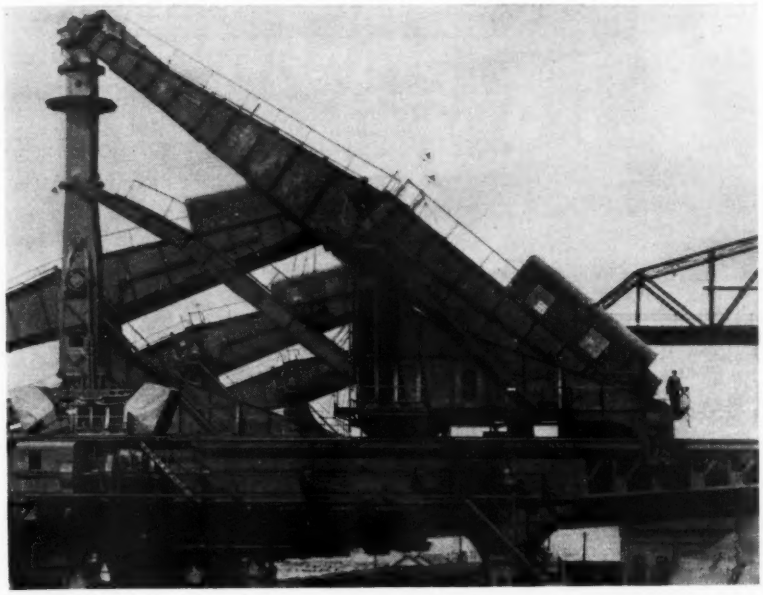
Type 44 is furnished with the rubber either in shear or in compression. In shear the maximum loading is 10 lbs., deflection at that load 5/32 inch and minimum disturbing frequency at that deflection 1200 per minute. In compression the maximum load is 50 lbs., deflection at this figure ⅛-inch and the minimum disturbing frequency at 5/32-inch deflection 1350 per minute.

Type 50 compression construction will take care of minimum disturbing frequencies from 1200 per minute and up and is made in 35, 40, 50 and 60 durometer hardnesses.

Type 60 is a compression mounting used where the lowest disturbing frequency is 1000 per minute with a maximum recommended load of 240 lbs., and 3/16th-inch deflection at this loading.

Industrial Dust Control

The Johnson - March Corporation, New York City, has announced the formation of an Industrial Division to serve manufacturing industries in the minimization of dust hazards. Compound "M," for control of dust in the mine, and Coaladd for permanent dustless treatment, were both developed by the company.



When the intermediate hoist gear broke on this giant ore unloader it was repaired, while still in position, with the use of a Westinghouse lexarc welder, with a shut-down of only four hours

To Reduce Noise Fatigue

For reducing the detrimental effects of noise upon workers, the Mine Safety Appliances Co. announces a new product—the M. S. A. Ear Defenders.

Fatigue, irritability, and nervous exhaustion experienced by workers in or about noisy operations are lessened

by the use of these Ear Defenders, which reduce loud noise by 35-45 decibles or to about one-tenth their former loudness, yet are so designed that warning signals and conversation can easily be heard. The resulting effect from the reduction of noise will enable the workmen better to concentrate on their jobs.

Essentially, each M. S. A. Ear Defender is a tapered tube molded from surgical-type soft rubber; consisting of two barriers, an outer one of metal and an inner one of soft rubber, separated by an air space. This tapered construction permits easy insertion and removal without any danger of coming in contact with the eardrum.

M. S. A. Ear Defenders can be easily cleaned with soap and water, thus insuring a sanitary article at all times.

Koppers Products To Brazil

Koppers Co. of Pittsburgh, Pa., has been awarded a contract for a complete by-product coke plant, consisting of 55 Becker type coke ovens, including a plant for the recovery of ammonia, tar, benzol, tuluol, etc., for Companhia Siderurgica Nacional (Brazilian National Steel Company) at Volta Redonda, near Rio de Janeiro, it was announced by Joseph Becker, vice president of Koppers Co. The contract was said to involve approximately $3,000,000.

This plant is to be built in connection with a blast furnace and steel plant. The contract was negotiated with Lt. Col. E. Macedo Soares e Silva, technical director of the abovenamed company, with offices at Cleveland, Ohio, and Arthur G. McKee & Co., builders of blast furnaces and steel plants, at Cleveland, Ohio, who are the engineers for the entire steel works.

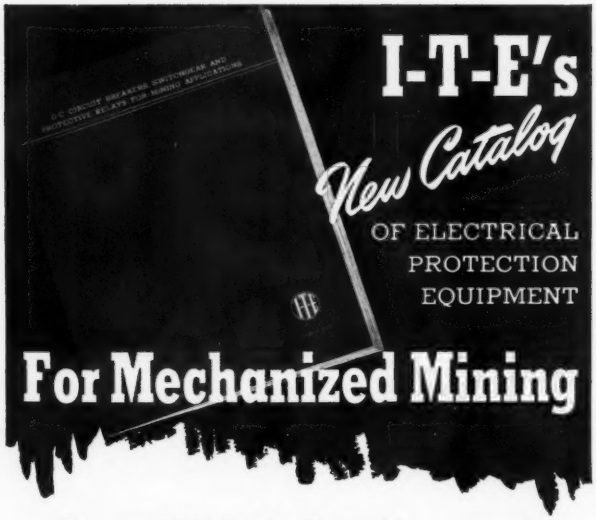
Dual Power Pump Drives

The assurance of uninterrupted water supply 24 hours a day from deep-well turbine pumps is provided by dual drives, according to the announcement of engineers of Peerless Pump Co., Los Angeles.

Normally equipped with electric motor head, the secondary drive may be by right-angle gear, powered by a gas, gasoline, or Diesel engine or steam turbine. In the event of interruption of electric service, the standby plant can be started instantly, either by the operator or by completely automatic control, thus providing a never-failing source of supply.

Other types of dual-drive pumps have steam turbines as primary power, with internal-combustion engines connected with the secondary right-angle gear. Either source of power operates independently of the other.

A shop crew at the La Porte, Indiana, plant of Allis-Chalmers Manufacturing Company working on a 90 mm. anti-aircraft gun mount. The company is beginning large-scale production of this weapon



The new I-T-E Catalog No. 2502 is a complete description of d-c circuit breakers, switchgear and protective relays for mining applications. Its completeness recommends it particularly to those who are engaged in or contemplating mechanized mining.

Send for your copy on your company letterhead.

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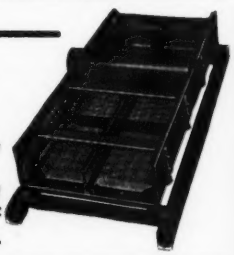

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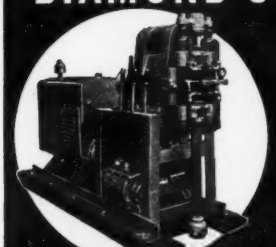

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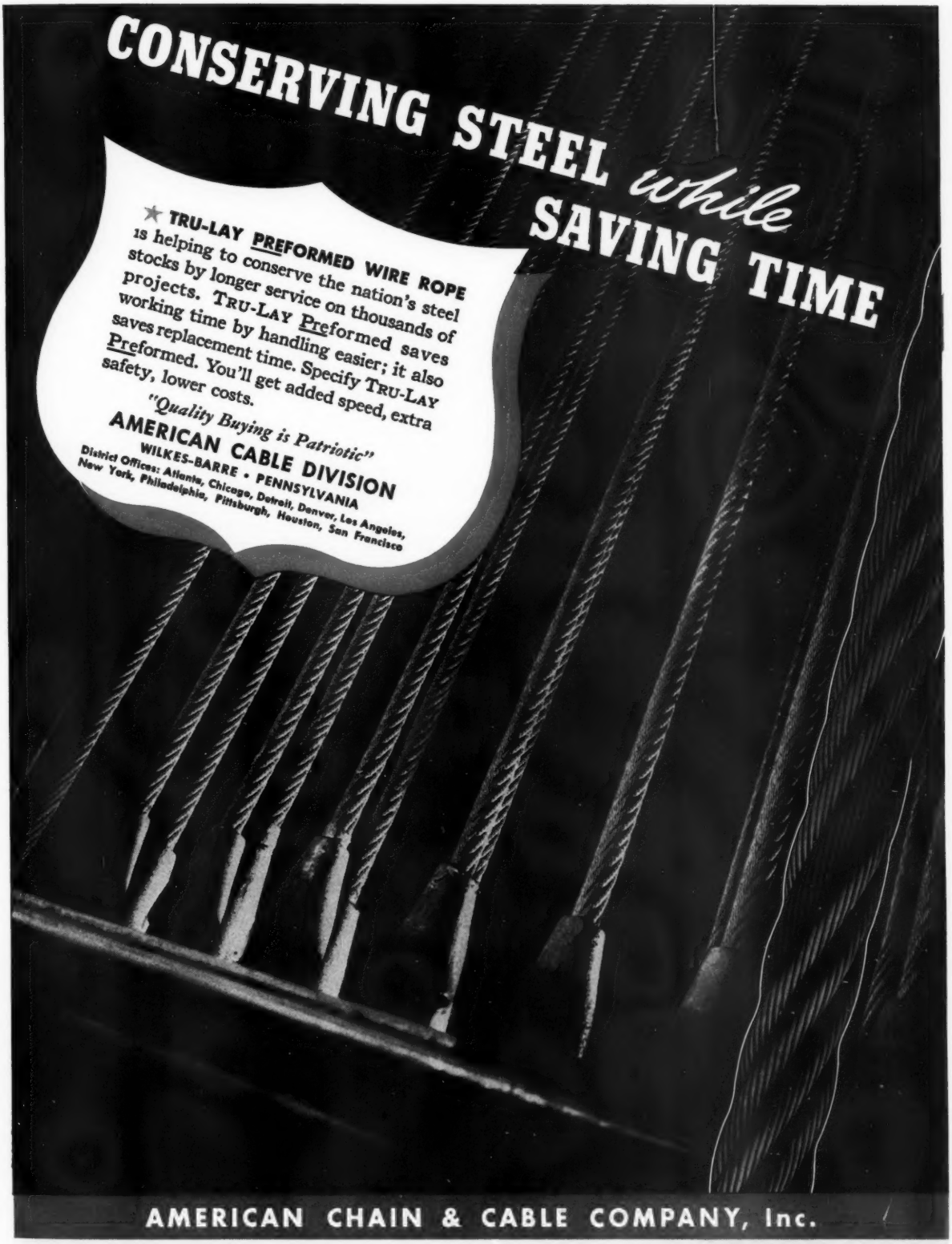
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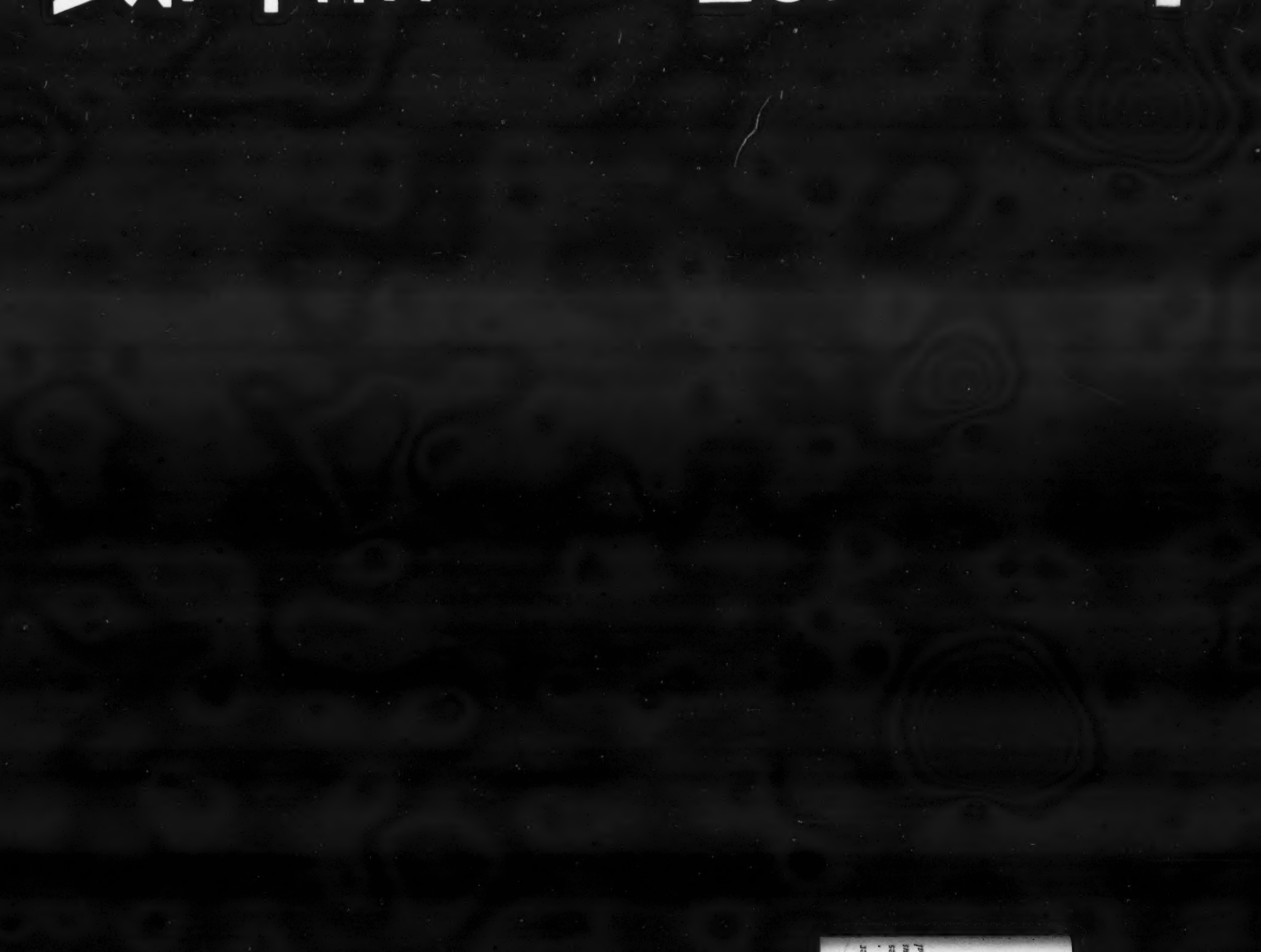
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